

# Taxonomic studies on *Eurydinotomorpha* Girault (Hymenoptera: Pteromalidae) with the description of a new species from Western Ghats, Kerala

P. M. Sureshan

*Zoological Survey of India, Western Ghat Regional Centre, Kozhikode 673 006, Kerala, India.*

(Email: pmsuresh43@gmail.com)

## Abstract

A new species of Pteromalidae viz. *Eurydinotomorpha indica* sp. n. is described from Mannavan shola forests of southern Western Ghats, Kerala. The affinities of the new species with related species are discussed and a key to the Oriental species and checklist of world species of *Eurydinotomorpaha* are also provided.

**Keywords:** *Eurydinotomorpha*, new species, Oriental Region, Key, Western Ghats, Kerala, India.

Received: 1 November 2016; Revised: 11 March 2017; Online: 25 March 2017.

## Introduction

The genus *Eurydinotomorpha* was described by Girault (1913) from Australia with the type species *E. pax* Girault. The genus belongs to the subfamily Pteromalinae of Pteromalidae (Hymenoptera) characterised by its peculiar propodeum and evaniform gaster. Sureshan & Narendran (1990) synonymised the genus *Asoka* Boucek with *Eurydinotomorpha* owing to its close resemblance with the latter in having similar gaster and propodeum. The genus is known by 9 species in the world distributed only in the Australasian Region and it is represented in India by the species *E. malabarensis* Sureshan & Narendran, 1990 described from the Malappuram district of Kerala (11° 8' 2.1" N 75° 53' 47" E). The species has been recently collected from Shendurny Wildlife sanctuary, Kollam district Kerala (8° 48' 43" N 77° 09' 00" E) (Sureshan, 2015). During the recent faunal exploration surveys conducted in the southern Western Ghats of Kerala, an interesting specimen of *Eurydinotomorpha* belonging to an undescribed species was collected and is described here. All efforts to collect further specimens from the same and adjacent areas did not yield any additional material due to the very rare nature of the genus which was only collected thrice, *E. malabarensis* Sureshan & Narendran in 1990

and 2012 and the present new species in 2013. The new species is interesting as it shows a close affinity with the species *E. appendigaster* (Boucek) described from Malaya and its collection from the Western Ghats throws further light to the interesting affinities of the fauna of the region.

## Materials and Methods

The specimen of the present study was collected by sweep net from the forested tracts of Mannavan shola forests of Idukki district, Kerala, (10° 11' 17.6" N 77° 10' 51.6" E) which is the largest Shola forest patch in Asia, exists in "Western Ghats", one of the Biodiversity hot spots of the world. The specimen was card mounted and studied under a stereoscopic binocular microscope (Leica M 205C) and photographs were taken with Leica MC 170 HD camera attached with the same microscope. The morphology used in this paper generally follows that of Boucek (1988) except Mesosoma and Metasoma are used for thorax and abdomen. The following abbreviations are used in the text: MV- Marginal vein; OOL- Ocellocular distance; PMV- Post marginal vein; POL- Post- ocellar distance; SMV- Submarginal vein; STV-Stigmal vein. The type specimen of the present study is



deposited in Zoological Survey of India, Western Ghat Regional Centre, Calicut (ZSIK).



**Fig. 1.** *Eurydinotomorpha indica* sp. n. Female, body in profile; **2.** *Eurydinotomorpha malabarensis* Sureshan & Narendran, female body in profile.

### *Eurydinotomorpha* Girault

*Eurydinotomorpha* Girault, 1913: 320. Type species *Eurydinotomorpha pax* Girault by original designation.

*Eurydinotomorpha* Girault, 1915b: 45. Type species *Eurydinotomorpha pax* Girault by original designation. Apparently based on the same type material. (Boucek, 1988: 453).

*Asoka* Boucek, 1973: 557. Type species *Asoka appendigaster* Boucek by original designation, synonymy by Sureshan & Narendran, 1990: 219-227.

**Diagnosis:** The genus can be distinguished from the related genera by the peculiar propodeum

(Figs.1, 2, 5, 6) which is relatively short, medially horizontal from its base or even ascending straight to the apex of the narrow neck, the narrow smooth elongate petiole moves from horizontal position down to a vertical position under the nuchal apex. Gaster elongated and mostly slender. Antennae with three anelli and five funicular segments. Anterior margin of clypeus shallowly emarginate or deeply and narrowly excised in the middle.

**Distribution:** Taiwan, Australia, Sri Lanka, India, Malaya.

### Key to the Oriental species of *Eurydinotomorpha* Girault (Modified from Sureshan & Narendran, 1990)

1. Propodeum (Fig. 6) with plicae weakly indicated, nuchal part projecting upwards and forwards over level of scutellum; petiole about 3x as long as scutellum; gaster slender.....*E. petiolatus* (Boucek)  
Sri Lanka, Malaya.
- Propodeum (Figs. 1, 2, 5) with plicae distinct, nuchal part projecting upwards to level of scutellum; petiole about as long as or shorter than scutellum; gaster shorter than in alternate.....2
2. Antenna with scape never exceeding above level of median ocellus; hypopygium extending at the level of hind margin of T4; epipygium not narrower than preceding tergite (Fig. 2); POL 3x OOL; antennae with funicular segments short.....  
...*E. malabarensis* Sureshan & Narendran  
India: Kerala
- Antenna with scape exceeding above median ocellus; hypopygium ending to the level of middle of T5; epipygium distinctly narrower or level with the preceding tergite; POL 2.1- 3x OOL; antennae with funicular segments long.....3
3. Gastral petiole short (Fig. 4), length 1.8x of its apical width and 3.3x of anterior width, with a short but distinct dorso-median carina in the anterior half; POL 3x OOL; epipygium not narrower than the preceding tergite.....*E. indica* sp. n.  
India: Kerala
- Gastral petiole long (Fig. 5), length 2.5x of



its apical width and 4.3x of anterior width, with a fine median arrow-like groove in the anterior part, not carinate; POL about 2.1x OOL; epipygium distinctly narrower than the preceding tergite.....*E. appendigaster* (Boucek) Taiwan

**Check-list of the world species of *Eurydinotomorpha* Girault**

1. *E. appendigaster* (Boucek), 1973: 559. Taiwan  
(= *Asoka appendigaster* Boucek, 1973)
2. *E. fusciventris* Girault, 1913: 320. Australia.
3. *E. basalis* Girault, 1915(a): 332. Australia
4. *E. grandis* Girault, 1915(a): 332. Australia
5. *E. incerta* Girault, 1915(a): 333. Australia
6. *E. malabarensis* Sureshan & Narendran, 1990: 220. India
7. *E. monteithi* Boucek, 1988: 453. Australia
8. *E. pax* Girault, 1913: 320. Australia  
(= *pax* Girault, 1915(b): 45)
9. *E. petiolatus* (Boucek), 1973: 560. Sri Lanka, Malaya  
(= *Asoka petiolatus* Boucek, 1973).
10. *E. indica* **sp. n.** India

***Eurydinotomorpha indica* sp. n.**  
(Figs. 1, 3, 4)

[urn:lsid:zoobank.org:act:21BEAE89-5611-42A2-9B03-79432F2D4D83](https://zoobank.org/urn:lsid:zoobank.org:act:21BEAE89-5611-42A2-9B03-79432F2D4D83)

**Material examined:** *Holotype*: Female, India: Kerala. Idukki dist., Mannavan shola NP, 10° 11' 17.6" N 77° 10' 51.6" E, 7.xi.2013, Reg.no.ZSI/WGRS/IR/INV/3168, coll. P.M. Sureshan.

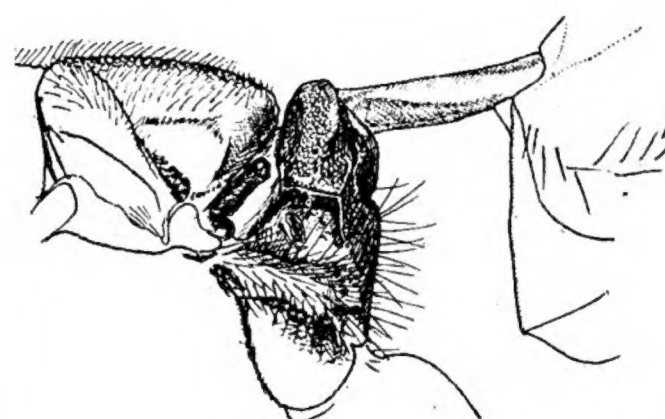
**Description:** Female: Length: 6mm. Head and mesosoma mainly bright metallic blue, partly darker on vertex, occiput and mesoscutum, slight bronzy tinge on lower face and propodeum dorsally, gaster blackish brown with iridescent bluish tinge on sides (middle); petiole dorsally metallic blue; fore and mid coxae



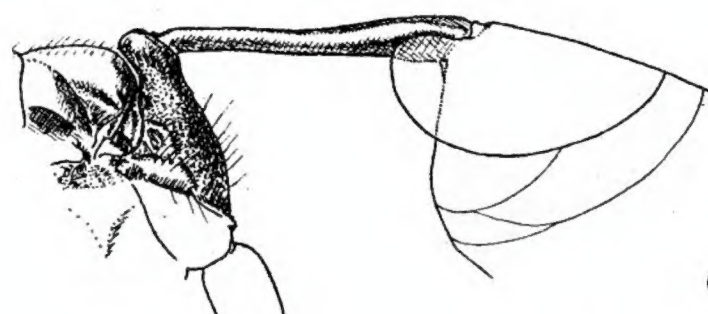
3



4



5



6

**Figs. 3-6:** 3, *E. indica* sp. n. female, anterior margin of clypeus; 4, gastral petiole dorsal view; 5, *E. appendigaster* (Boucek), female, attachment of petiole on propodeum; 6, *E. petiolatus* (Boucek), female, attachment of petiole on propodeum (source: Boucek, 1973)

brown, hind coxae metallic blue, all femora infuscate except base and tips testaceous, rest of legs testaceous except tips of tarsi infuscate. Antennae brown except base of scape testaceous, eyes cupreous, ocelli silvery, wings sub hyaline, veins and pubescence brown.



**Head:** 1.1x as broad as mesoscutum, 1.8x as broad as long in dorsal view and 1.23x as broad as high in facial view, ocelli large, long, diameter of lateral ocellus slightly shorter than distance between lateral and median ocellus and between lateral ocellus and eye margin: POL 3x OOL. Head moderately reticulate, meshes broad, reticulation finer towards lower part, a shiny spot just above clypeus, reticulation coarser on vertex and occiput; clypeus (Fig. 3) radiately striated, striae extending little outside to paraclypeal region, pubescence moderately long; malar grooves distinct, anterior margin of clypeus with two blunt teeth, separated by a deep notch; dorsal margin of eyes moderately diverging backwards, eyes 1.3x as long as broad (in profile); malar space 0.5x eye length, temple short, 0.2x eye length. Scrobe deep reaching median ocellus; antennal scape slightly curved, 0.7x as long as eye, pedicel plus flagellum 1.3x as long as head width, third anellus little longer than others, funicular segments longer than broad, each with four irregular rows of long sensillae, area of micropilosity restricted on tip only, clava as long as 1.5x preceding segments combined.

**Mesosoma:** 1.6x as long as broad (including propodeum), only slightly narrowed towards both ends. Pronotal collar medially less than 0.25x as long as mesoscutum, posteriorly broadly emarginate, swollen along hind margin and from there fairly sloping towards anterior collar carina. Mesoscutum with distinct though irregular transverse rugulae in anterior part of mid lobe, mid lobe anteriorly convex. Scutellum about as long as broad, moderately convex. Metanotum well visible on sides, dorsellum smooth and shiny. Nuchal region of propodeum thrust upwards to level of scutellum, plicae strong, sides and posterior wall of propodeum with long and white pubescence, posterior part separated from subpetiolar area by strong keels which converge from dorsal margin of coxal socket upwards to circumpetiolar rim, approach each other closely below petiole but do not meet. Mesopleuron ventrally and anteriorly pubescent, also ventral aspect of all coxae densely hairy. Forewing length 2.7x width. Relative lengths of costal cell 39.5, MV 24, PMV 25. STV 6.5.

**Metasoma:** Petiole (Fig. 4) in dorsal view expanding caudad, length 1.8x apical width and

3.3x basal width, surface dorso-basally with distinct granulation and a fine dorso-median carina in the anterior half, anterior tergites smooth but their sides as well whole of distal tergites slightly dull owing to a microscopic cross-striation with intermixed fine punctures bearing short whitish pubescence.

**Male:** Unknown.

**Biology:** Unknown, occurs in forests.

**Remarks:** This species closely resembles and readily look like *Eurydinotomorpha appendigaster* (Boucek) but differs from it as follows: in *indica* sp. n. gastral petiole short, length 1.8x apical width and 3.3x anterior width and with a short but distinct dorso-median carina in the anterior half, POL 3x OOL, (in *E. appendigaster* the petiole length 2.5x of its apical width and 4.3x of its anterior width, and with a fine median arrow-like groove in the anterior part and POL about 2.1x OOL).

**Etymology:** The species name is derived from the name of the country where collections were made.

#### Acknowledgements

I am grateful to Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata for the facilities and encouragement. I am also thankful to the Chief Wildlife Warden, Kerala and the forest officials of Mannavan shola National Park, Idukki for granting the permission for faunistic surveys and specimen collection and other helps rendered during the field work.

#### References

- Boucek, Z. 1973. An interesting new genus or Pteromalidae (Hymenoptera) with evaniform gaster. *Oriental Insects* 7(4): 557-561.
- Boucek, Z. 1988. Australasian Chalcidoidea (Hymenoptera). A biosystematic revision of genera of fourteen families, with a reclassification of species. Wallingford, U.K.: C.A.B. International. 832pp.
- Girault, A.A. 1913. Australian Hymenoptera Chalcidoidea. VI. The family Pteromalidae with descriptions of new genera and species.



**Taxonomic studies on *Eurydinotomorpha* Girault with the description of a new species**

- Memoirs of Queensland Museum 2: 303-334.
- Girault, A.A. 1915a. Australian Hymenoptera Chalcidoidea. VI. Supplement. Memoirs of the Queensland Museum 3: 313-346
- Girault, A.A. 1915b. Some chalcidoid Hymenoptera from North Queensland. Canadian Entomologist 47: 42-48.
- Sureshan, P.M. and Narendran, T.C. 1990. Taxonomic studies on *Eurydinotomorpha* and *Netomocera* (Hymenoptera: Chalcidoidea: Pteromalidae). Oriental Insects 24: 219-227.
- Sureshan, P.M. 2015. On the fauna of Pteromalidae (Hymenoptera: Chalcidoidea) of South Western Ghats. Records of Zoological Survey of India. Occasional paper No.359:1-63+8 plates.



## Oral Myiasis: Case Report

<sup>1</sup>Thiruneervannan, <sup>1\*</sup>Hari S. Prabhu and <sup>2</sup>Benjamin Premkumar

<sup>1</sup>Dept. Oral Medicine & Radiology, Vinayaka Mission's Dental College, AVMC campus, Kirumampakkam, Puducherry, India 607402.

<sup>2</sup>Dept. Oral & Maxillofacial Surgery, Vinayaka Mission's Dental College, AVMC campus, Kirumampakkam, Puducherry, India 607402.

(Email: harisureshprabhu@gmail.com)

### Abstract

A 21 year old male patient reported to our outpatient department with a swelling in the anterior palatal surface. On examination, few maggots were actively moving around the affected area. The maggots were isolated and local debridement of the wound was done. The maggots were preserved in 10% formalin for species identification. The maggots were identified to be *Chrysomya bezziana* Villeneuve, 1914 (Old world screw-worm fly).

**Keywords:** Myiasis, Entomology, *Chrysomya bezziana* Villeneuve, 1914

Received: 5 September 2016; Revised: 18 November 2016; Online: 21 March 2017.

### Introduction

Myiasis was first described by Hope in 1840. The word Myiasis is derived from greek word "Myia" means fly and "asis" means disease (Shinohara *et al.*, 2004; Rossi-Scheider *et al.*, 2007; Sharma *et al.*, 2008). Myiasis is caused by dipterous larvae that feed on living tissues of warm-blooded mammals. While the adults are saprophagous.

The incidence of oral myiasis is comparatively less as compared to cutaneous variety, as oral tissues are not constantly exposed to the external environment (Rossi-Scheider *et al.*, 2007). Myiasis is defined as an infestation of living humans and vertebrate animals with dipterous larvae that feed on the host's dead or living tissue, liquid body substances or ingested food (Ramli and Rahman, 2002; Baskaran *et al.*, 2007; Sharma *et al.*, 2008). The adult female lays eggs on live mammals.

The sites of infestations are mostly surface wounds, sores and mucous membranes. The egg hatch within 24 hours and the larvae burrow inside the host's tissue with head downwards into the wound in a screw-like fashion. Hence the name "screw worm". The

larvae complete their growth in 5-7 days, and then they come out of the wound to pupate (Baskaran *et al.*, 2007).

Studies say development of the larvae depends on the temperature.

Wijesundra (1957) reported that the eggs hatch at 27°C in 9-10 hours. Wells and Kurahashi (1994) found larvae took a period of 9.75 days to mature at 27°C (Bharti *et al.*, 2007).

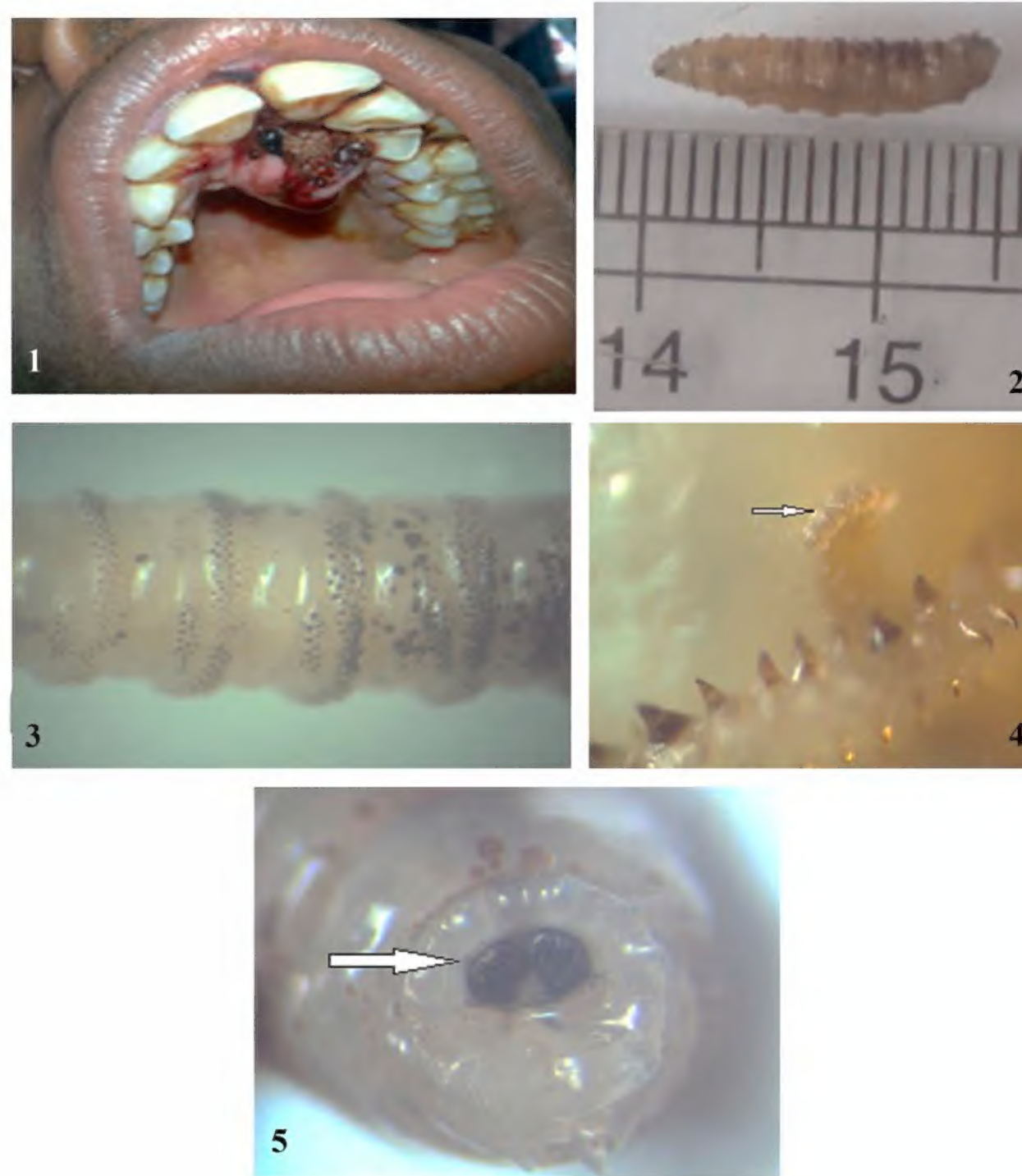
The life cycle of the fly includes egg, three instars, prepupa and adult. The life span of the adult is for about 40 days and the size measures about 8.0-12.0 mm.

### Materials and Methods

A 21-year-old mentally retarded male patient reported to our outpatient department. On examination, a diffuse swelling measuring around 25mm on the anterior palatal surface was present, with few maggots actively moving over the affected area. The swelling showed superficial ulcerations with mild bleeding. The patient was clinically diagnosed to have Oral Myiasis. During debridement of the infected area, the maggots were isolated and were preserved in 10% formalin. The larvae were in



PLATE 1



**Figure 1. Oral myiasis affected individual; 2-5: *Chrysomya bezziana* larva, 2. Length; 3. Ring of spines; 4. Anterior spiracles with four lobes; 5. Posterior spiracular plates.**

third instar stage. The specimens were sent for identification to the entomology department of Loyola College, Chennai. Larvae were examined under a stereomicroscope and the morphological features were photographed.

**Characters used to identify species**

Morphology of the larvae: The length of the larva was 15mm (Fig. 2). *Chrysomya bezziana* larva bears prominent rings of spines around the body (Fig. 3). The spines are always single pointed and thorn-like. The anterior spiracles have four lobes (Fig. 4). The posterior spiracular plates are darkly pigmented, incomplete peritreme partially enclosing three straight,

slightly oval shaped slits, which point towards the break in the peritreme (Fig. 5).

**Result**

Based on the morphological features of the larvae it was confirmed that the larva belongs to the species '*Chrysomya bezziana* Villeneuve, 1914'.

**Discussion**

Human myiasis has been reported occurring in eyes, nose, Paranasal sinuses rectum, urogenital tract and the oral cavity. Only a few cases of oral myiasis are reported in the literature. Improper oral hygiene, malnutrition,



unhealthy living surroundings are found to be the predisposing factors.

Ill-fitting dentures, chronic periodontal diseases, mouth breathing, neuromuscular disturbances, peripheral vascular diseases and immune-compromised conditions are the major risk factors for poor oral hygiene. Altered weather conditions have also been reported to increase the incidence of human myiasis. In 2008, following heavy rainfall in French Guiana, an epidemic outbreak of human myiasis was reported (Sheik *et al.*, 2011). In this case report, poor living surroundings, mental retardation and neuromuscular disturbance were found to be the predisposing factors for oral myiasis.

#### Acknowledgment

We thank Dr. M. Gabriel Paulraj Scientist, Entomology Research Institute, Loyola College, Chennai for his valuable cooperation in this study.

#### References

- Baskaran, M., Jagan Kumar, B., and Geevarghese, A. 2007. Cutaneous Myiasis of face. *Journal of Oral and Maxillofacial Pathology* 11: 70-72.
- Bharti, M., Singh, D. and Sharma, Y.P. 2007. Effect of temperature on the development of forensically important blowfly, *Chrysomya megacephala* (Fabricius) (Diptera: Calliphoridae). *Entomon* 32(2): 149-151.
- Hope, F.W. 1840. On insects and their larvae occasionally found in the human body. *Transactions of the Royal Entomological Society of London*, 2: 256-271.
- Ramli, R. and Rahman, A.R. 2002. Oral Myiasis: Case report. *The Malaysian Journal of Medical Sciences* 9(2): 47-50.
- Rossi- Scheider, T., Cherubini, K., Yurgel, L.S., Salum, F. and Figueiredo, M.A. 2007. Oral Myiasis: A Case report. *Journal of Oral Science* 49(1): 85-88.
- Sharma, J., Mamatha, G.P. and Acharya, R. 2008. Primary oral Myiasis: A case report. *Medicina Oral Patologia Oral y Cirugia Bucal* 13(11): E714-716.
- Sheikh, S., Pallagatti, S., Singla, I., Kalucha, A., Aggarwal, A. and Kaur, H. 2011. Oral Myiasis- A review. *Journal of Clinical and Experimental Dentistry* 3(5): e465-8.
- Shinohara, E.H., Martini, M.Z., de Olivera Neto, H.G. and Takahashi, A. 2004. Oral Myiasis Treated with Ivermectin: Case Report. *Brazilian Dental Journal* 15(1): 79-81.
- Wells, J.D. and Kurahashi, H. 1994. *Chrysomya megacephala* (Fabricius) (Diptera: Calliphoridae) development, Rate, variation and implications for forensic entomology. *Japanese Journal of Sanitary Zoology* 45(4): 303-309.
- Wijesundra, D.P. 1957. The life history & bionomics of *Chrysomya megacephala* (Fab.). *Ceylon Journal of Science* 25: 169-185.



## New record of scoliid wasps (Hymenoptera: Scoliidae: Scoliinae) from Bhutan

\*Tshering Nidup<sup>1</sup>, Wim Klein<sup>2</sup>, P. Girish Kumar<sup>3</sup> and Phurpa Dorji<sup>4</sup>

<sup>1,4</sup>*Department of Environment & Life Sciences, Sherubtse College, Royal University of Bhutan, Trashigang, Bhutan.*

<sup>2</sup>*Naturalis Biodiversity Centre, 2300 RA Leiden, Netherlands.*

<sup>3</sup>*Western Ghats Regional Centre, Zoological Survey of India, Kozhikode, Kerala- 673 006, India.*

(Email: [tsheringnidup.sc@sherubtse.edu.bt](mailto:tsheringnidup.sc@sherubtse.edu.bt))

### Abstract

Eighteen species of scoliid wasps from Bhutan (Scoliidae: Scoliinae) are documented here of which 17 species, namely, *Megacampsomeris cochinchensis* (Betrem), *M. shillongensis* (Betrem), *Campsomeriella (Annulimeris) annulata annulata* (Fabricius), *C. (Campsomeriella) collaris collaris* (Fabricius), *Phalerimeris phalerata phalerata* (de Saussure), *Megascolia (Regiscolia) azurea hindostana* (Micha), *M. (R.) azurea christiana* (Betrem & Guiglia), *Scolia (Discolia) desidiosa* Bingham, *S. (D.) binotata binotata* Fabricius, *S. (D.) kamengensis* Gupta & Jonathan, *S. (D.) fasciatopunctata dunensis* Betrem, *S. (D.) elizabethae* Betrem, *S. (D.) rugifrons* Betrem, *S. (D.) clypeata rufuhirta* Betrem, *S. (D.) venusta* Smith, *S. (D.) dehraensis* Betrem and *Liacos erythrosoma erythrosoma* (Burmeister) are reported for the first time from Bhutan.

**Keywords:** *Scoliidae, Bhutan, new record.*

Received: 8 December 2016; Revised: 12 May 2017; Online: 17 May 2017.

### Introduction

The members of the family Scoliidae are commonly known as hairy wasps usually with strong sexual dimorphism and are distributed globally. They are used as agents for insect pest control. The larvae are parasitoid of coleopteran larvae of family Scarabaeidae, which are forest and agricultural pests but adults feed on nectar (Gupta & Jonathan, 2003). This group is differentiated by the close striolate wing membrane beyond the cells of forewing and the meso- and metasternum forming a flat plate covering the bases of the mid and hind coxae. It constitutes small to large size wasps with yellow, red or orange maculation. Wings are dark with metallic iridescence and white to bright golden-reddish vestiture (Krombein, 1978). Seventy nine species are recorded from Indian sub-region but knowledge on scoliid wasps of Bhutan is very limited with only three species, *Scolia (Discolia) sikkimensis* Bingham, *Sericocampsomeris stygia stygia* (Illiger) and *Megacampsomeris asiatica himalayana*

(Betrem) (Gupta & Jonathan, 2003). Here eighteen species are documented from various districts of Bhutan of which 17 species are new record from the country.

### Materials and Methods

A total of 49 specimens were studied from various districts of Bhutan. Specimens were euthanized with Ethyl Acetate and studied under stereoscopic microscope. Photographs were taken using Nikon D5100 with attached AF-S Micro Nikkor 40 mm macro lens. Measurements were taken with digital Vernier caliper nearest to 0.01 mm. Measurements provided refers to the total length (Head + Mesosoma + Metasoma). Identifications were based on the keys and descriptions provided by Bingham (1897), Gupta & Jonathan (2003), Kumar (2009a & 2009b; 2015), Kumar & Sharma (2015) and Kumar & Pham (2015). The terminologies primarily follow Gupta & Jonathan (2003). The pinned and dried



specimens were deposited in National Biodiversity Center (NBCB) museum, Serbithang, Thimphu, Bhutan. Elevations above sea level (Alt.) were provided in meters (m). Latitudes and longitudes were provided in decimal degrees as denoted from Garmin eTrex 10.

*Abbreviations used for the Museums:*  
BMNH — Natural History Museum (or British Museum of Natural History), London, UK; HSMP — Halle State Museum of Prehistory, Halle, Germany; IARI — Indian Agricultural Research Institute, New Delhi, India; NBCB — National Biodiversity Centre, Bhutan; NZC — Zoological survey of India, Kolkata, India; OUM — Oxford University Museum, Oxford; RMNH — Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, Netherlands; ZMB — Zoologisches Museum der Humboldt Universität, Berlin, Germany; ZMUC — Universitets København, Zoologisk Museum, København, Denmark.

## Systematic Account

### 1. *Megacampsomeris asiatica himalayana* (Betrem)

*Campsomeris (Megacampsomeris) asiatica himalayana* Betrem, 1928: 141.  
Holotype ♀, Bhutan (RMNH).

*Megacampsomeris asiatica himalayana* (Betrem): Betrem & Bradley, 1972: 164.

**Diagnosis:** This species is distinguished from the congeners by having black integuments with apical fringes of silvery white setae on basal four tergites and predominantly yellowish hyaline wings; vestiture on legs entirely white.

**Measurements:** 5♀: 23.03-26.85 mm.

**Materials examined:** Wang Sisina, Thimphu (89.572E, 27.354N, Alt. 2209 m): 4♀ collected by Tshering Nidup & Wim Klein on 03.viii.2016 from the side of Thimphu-Phuntsholing highway; Lungtenphu, Thimphu (89.65E, 27.45N, Alt. 2300 m): 1♀ collected by H.R. Feijen on 12.vii.1990.

**Distributional record:** Bhutan, India & Nepal (Gupta & Jonathan, 2003).

### 2. *Megacampsomeris cochinensis* (Betrem)

*Campsomeris (Megacampsomeris) cochinensis* Betrem, 1928: 151. Type ♂, Parambikulam, Kerala, India (NZC).

*Megacampsomeris cochinensis* (Betrem): Betrem & Bradley, 1972: 164.

**Diagnosis:** This species is distinguished from the congeners by having abundant golden-reddish vestiture on entire body; yellowish hyaline wing with golden effulgence; forewing with large diffused infumated area beyond marginal cell; legs black except coxae in male.

**Measurements:** 5♀: 19.97-23.67 mm.

**Materials examined:** Khaling, Trashigang (91.6033E, 27.2058N, Alt. 2073 m): 4♀ collected by Tshering Nidup & Phurpa Dorji on 01.i.2015 from the village above Khaling town; Kanglung, Trashigang (91.5218E, 27.2873N, Alt. 1823 m): 1♀ collected by Phurpa Dorji & Tshering Nidup on 28.ix.2014 from the Sherubtse College campus.

**Distributional record:** Bhutan & India (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

### 3. *Megacampsomeris shillongensis* (Betrem)

*Campsomeris (Megacampsomeris) shillongensis* Betrem, 1928: 155-156. Type ♀, Shillong, India (IARI).

*Megacampsomeris shillongensis* (Betrem): Betrem and Bradley, 1972: 164.

**Diagnosis:** This species is distinguished from the congeners by having yellow apical bands on I-IV tergites and II-IV sternites; clypeus entirely yellow; mesoscutum and scutellum with small postero-lateral yellow markings; all femora with yellow marking on outside; vestiture golden except black on fifth to last segments; wings yellowish hyaline with forewing darker anteriorly.

**Measurements:** 6♂: 17.36-20.46 mm.

**Materials examined:** Khaling, Trashigang: 1♂ collected by Tshering Nidup & Phurpa Dorji on 01.i.2015; Kanglung: 1♂ collected by Phurpa Dorji & Tshering Nidup on 28.ix.2014; Jigmechholing, Sarpang (90.5480E, 26.9544N, Alt. 780 m): 4♂ collected by Tshering Nidup & Wim Klein on 14.x.2015 from the desolated house above the Zhemgang-Gelephu highway.

**Distributional record:** Bhutan, India, Myanmar & Nepal (Gupta & Jonathan, 2003; Kumar & Pham, 2015).



**Note:** New record for Bhutan.

**4. *Campsomeriella (Annulimeris) annulata annulata* (Fabricius)**

*Tiphia annulata* Fabricius, 1793: 225. Type ♀, China (ZMUC).

*Campsomeris (Campsomeriella) annulata annulata* (Fabricius): Tsuneki, 1972: 18-19. ♀ & ♂; Taiwan, Japan & Korea.

**Diagnosis:** *Male:* This species is distinguished by having following parts yellow: medially interrupted line on scutellum; metanotum disc; mandibles at base; apical bands on I-V tergites; pronotum posteriorly; narrow bands on II-IV sternite interrupted medially; all femur on outer view; vestiture white except on two apical tergites, black; antennal flagellum black; wings slightly infumated with yellowish reflections. *Female:* with black integument, white vestiture except on last abdominal segment black, wings hyaline except apical third of forewing dark brown.

**Measurements:** 8♂: 12.39-18.6 mm; 1♀: 23.27 mm.

**Materials examined:** Kanglung, Trashigang: 1♂ collected by Phurpa Dorji & Tshering Nidup on 28.ix.2015; Menghugang Lingmethang, Mongar: 1♂ collected by Phurpa Dorji & Wim Klein on 23.x.2015 along the highway; Kafu, Yadi, Mongar (91.36472E, 27.3275N, Alt. 885 m): 2♂ collected by Phurpa Dorji & Wim Klein on 22.x.2015 from Kafu village; Berti, Zhemgang (90.6675E, 27.1572N, 531 m): 3♂ collected by Tshering Nidup & Wim Klein on 15.x.2015 from Berti Village; Pasakha, Chhukha (89.4541E, 26.8430N, Alt. 329 m): 1♂ collected by Tshering Nidup & Wim Klein on 08.x.2015 from industrial area; Aman Resort, Punakha (89.8152E, 27.6325N, Alt. 1254 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 15.v.2015 from the Pho Chhu Bank.

**Distributional record:** Bhutan, India, China, Indonesia, Japan, Korea, Malaysia, Myanmar, Taiwan & Nepal (Gupta & Jonathan, 2003; Kim, 2009; Kumar, 2015; Kumar & Pham, 2015).

**Note:** New Record for Bhutan.

**5. *Campsomeriella (Campsomeriella) collaris collaris* (Fabricius)**

*Tiphia collaris* Fabricius, 1775: 354. Type ♀, Malabar (ZMUC).

*Campsomeriella (Campsomeriella) collaris collaris* (Fabricius): Krombein, 1978: 18-19.

**Diagnosis:** This species is distinguished by having black integument; vestiture on occiput, scapula and mesoscutum white; wings dark brown with deep blue reflection.

**Measurement:** 2♀: 20.00-20.46 mm.

**Materials examined:** Kapatapsa, Wangdi Phodrang (89.765E, 27.7108N, Alt. 1476 m): 1♀ collected by Phurpa Dorji & Wim Klein on 26.x.2015 from the village; Phuntsholing, Chhukha (89.047E, 26.876N, 213 m): 1♀ collected by Tshering Nidup & Wim Klein on 05.viii.2016 from the Toorsa river bank near the crematorium.

**Distributional record:** Bhutan, India, Nepal & Sri Lanka (Gupta & Jonathan, 2003; Kumar, 2015).

**Note:** New record for Bhutan.

**6. *Phalerimeris phalerata phalerata* (de Saussure)**

*Elis (Campsomeris) phalerata* Saussure, 1858: 233. Type ♀, Java (ZMUC).

*Phalerimeris phalerata phalerata* (Saussure): Bradley, 1974: 460.

**Diagnosis:** This species can be differentiated from other species by having group of deep punctures in front of anterior ocellus; narrow yellow apical bands on tergites; well defined dark subapical mark on forewing.

**Measurement:** 2♀: 15.5-16.21 mm.

**Materials examined:** Nangkhon, Pema Gatshel (91.3458E, 27.0211N, Alt. 1434 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 12.vii.2015 from the Nangkhon village; Sithikhet, Tsirang (90.14E, 27.0211N, Alt. 1256 m): 1♀ collected by Tshering Nidup & Wim Klein on 12.x.2015 from the farm land.

**Distributional record:** Bhutan, India, China, Indonesia, Malaysia, Myanmar, Nepal, Taiwan & Thailand (Gupta & Jonathan, 2003; Kumar & Pham, 2015; Kumar, 2015).

**Note:** New record for Bhutan.





**Fig. 1:** *Megacampsomeris asiatica himalayana* (♀)



**Fig. 4:** *Campsomeriella (Annulimeris) annulata annulata* (♀)



**Fig. 2:** *Megacampsomeris cochinensis* (♀)



**Fig. 5:** *Campsomeriella (Campsomeriella) collaris collaris* (♀)



**Fig. 3:** *Megacampsomeris shillongensis* (♂)



**Fig. 6:** *Phalerimeris phalerata phalerata* (♀)

**7. *Megascolia (Regiscolia) azurea hindostana* (Micha)**

*Triscolia azurea hindostana* Micha, 1927: 121-122. Types ♀, ♂, South India (ZMB).

*Megascolia (Regiscolia) azurea hindostana* (Micha): Bradley, 1972: 10.

**Diagnosis:** *Female:* Black with following parts reddish-yellow: frontal spatium; front and vertex entirely; paired large oval spots on third tergite; IV and V tergite entirely; vestiture black except reddish on III-last tergites. This subspecies can be distinguished by having black pygidial setae.



**Male:** Black with following parts reddish-yellow: spot in ocular sinus, line on upper posterior margin of eye, paired large spot on III tergite, IV to V tergite almost entirely; vestiture black except on III to last tergites reddish brown; wings dark brown with violaceous effulgence.

**Measurements:** 2♀: 33.33-36.5 mm; 1♂: 25.91 mm.

**Materials examined:** Nganglam, Pema Gatshel (91.2494E, 26.8355N, Alt. 133 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 11.v.2015 from the Nganglam Lake near Nganglam Primary School; Chenery, Trashigang (91.316E, 27.316N, 758 m): 1♂ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 10.iv.2016 from Bamridrang stream bank.

**Distributional record:** Bhutan & India (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

#### 8. *Megascolia (Regiscolia) azurea christiana* (Betrem & Guiglia)

*Scolia (Triscolia) rubiginosa* Fabricius: Magretti, 1892: 236, Types ♀, ♂, Myanmar.

*Megascolia (Regiscolia) azurea christiana* (Betrem & Guiglia): Betrem & Bradley, 1964a: 444.

**Diagnosis:** This subspecies can be distinguished from *M. (R.) azurea hindostana* by red pygidial setae.

**Measurement:** 1♀: 35.84 mm.

**Materials examined:** Trashigang Pam, Trashigang (91.5369E, 27.3113N, Alt. 987 m): 1♀ collected by Tshering Nidup, Tshewang Dendup, Dhendup Tshering & Tashi Jamtsho on 01.iv.2016 from Nanga Motor Workshop.

**Distributional record:** Bhutan, India, Bangladesh, Myanmar & Nepal (Gupta & Jonathan, 2003; Kumar, 2009a & b; Kumar & Pham, 2015).

**Note:** New record for Bhutan.

#### 9. *Scolia (Discolia) desidiosa* Bingham

*Scolia desidiosa* Bingham, 1896: 424. Holotype ♀, Sikkim, India (BMNH).

*Scolia (Discolia) desidiosa* Bingham, 1897: 86-87, ♀, ♂; Sikkim, India; Myanmar.

**Diagnosis:** *Female:* Black with following parts yellow: paired spots on frontal spatium; scapula; spot on upper plate of mesopleurum; broad band on scutellum and metanotum; propodeum laterally; apical band on I-IV tergites emarginate in middle; legs and tegula black; vestiture white except black on posterior margin of all tergites; wing yellowish hyaline, forewing dark anteriorly. *Male:* can be differentiated by much broader than high clypeus and highly yellow maculated integument.

**Measurement:** 1♀: 25.8 mm; 2♂: 15.18-16.96 mm.

**Materials examined:** Wokhuna, Punakha (89.7886E, 27.6405N, Alt. 1362 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 15.v.2015 from the Wokhuna village; Panbang, Zhemgang (90.933E, 26.833N, Alt. 113 m): 1♂ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 17.iv.2016 from the confluent of Drangme Chhu and Mangde Chhu; Panbang, Zhemgang (90.90E, 26.866N, Alt. 144 m): 1♂ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 16.iv.2016 from Chengar Zam village near the Mangde Chhu bank.

**Distributional record:** Bhutan, India, Myanmar & Taiwan (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

#### 10. *Scolia (Discolia) binotata binotata* Fabricius

*Scolia binotata* Fabricius, 1804: 244. Type ♂, Tranquebar (ZMUC).

*Scolia (Discolia) binotata binotata* Fabricius: Krombein, 1978: 41-43, ♀, ♂, Sri Lanka.

**Diagnosis:** Black; III & IV tergite with paired rounded red spot; vestiture black mixed with white; base of forewing dark brown with bluish purple effulgence. *Female:* black integument; III and IV tergites with paired large rounded red or light red spots; vestiture black except white on occiput; forewing anteriorly darker with blue reflection.

**Measurements:** 2♂: 13.74-14.50 mm; 1♀: 14.19 mm.

**Materials examined:** Doksum, Trashy Yangtse (91.5738E, 27.435N, Alt. 840 m): 1♂ collected





**Fig. 7:** *Megascolia (Regiscolia) azurea hindostana* (♂)



**Fig. 10:** *Scolia (Discolia) binotata binotata* (♂)



**Fig. 8:** *Megascolia (Regiscolia) azurea christiana* (♀)



**Fig. 11:** *Scolia (Discolia) kamengensis* (♀)



**Fig. 9:** *Scolia (Discolia) desidiosa* (♀)



**Fig. 12:** *Scolia (Discolia) fasciatopunctata dunensis* (♂)

by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen along the highway; Gyelposhing, Mongar (91.2094E, 27.2113N, Alt. 565 m): 1♂ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 17.v.2015 from Hydro-power dam area; Kanglung, Trashigang: 1♀ collected by Phurpa Dorji & Tshering Nidup on

25.vii.2016 from the paddy field in Thragom village.

**Distributional record:** Bhutan, India & Sri Lanka (Gupta & Jonathan, 2003; Kumar & Pham, 2015; Kumar, 2015).

**Note:** New record for Bhutan.



**11. *Scolia (Discolia) kamengensis* Gupta & Jonathan**

*Scolia (Discolia) kamengensis* Gupta & Jonathan, 2003: 197. Holotype ♀, India (NZC).

**Diagnosis:** This species is differentiated by black body with following parts reddish yellow: paired large oval spots on third tergite almost united medially; vestiture black except reddish on third to last tergites; wings brown with coppery reflections.

**Measurements:** 2♀: 24.56-24.88 mm.

**Materials examined:** Kanglung, Trashigang: 1♀ collected by Phurpa Dorji & Tshering Nidup on 28.ix.2015 from Sherubtse College Campus; Wachey, Wangdi Phodrang (89.866E, 27.6N, Alt. 1506 m): 1♀ collected by Tshering Nidup & Wim Klein on 12.viii.2016 from the east-west highway.

**Distributional record:** Bhutan & India (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

**12. *Scolia (Discolia) fasciatopunctata dunensis* Betrem**

*Scolia (Scolia) dunensis* Betrem, 1928: 251, Holotype ♂, Dehra Dun, India (NZC).

*Scolia (Discolia) dunensis* Betrem: Betrem & Bradley, 1964b: 92.

**Diagnosis:** This species is differentiated with entirely black integument and vestiture; wings light brown; forewing darker anteriorly with coppery reflections.

**Measurements:** 2♂: 16.32-17.29 mm.

**Materials examined:** Nangkhoh, Pema Gatshel: 2♂ collected by Tshering Nidup & Phurpa Dorji on 12.vii.2015 from Nangkhoh village.

**Distributional record:** Bhutan & India (Gupta & Jonathan, 2003; Jadhav *et al.*, 2014; Kumar, 2015; Kumar & Pham, 2015).

**Note:** New record for Bhutan.

**13. *Scolia (Discolia) elizabethae* Bingham**

*Scolia (Discolia) elizabethae* Bingham, 1897: 1, Types: ♀, ♂, India (BMNH).

*Scolia (Discolia) elizabethe* Bingham: Betrem & Bradley, 1964b: 40.

**Diagnosis:** *Male:* Black with following parts yellow: paired elongated lateral spots on III tergite, clypeus except anterior margin, front, vertex, ocular sinus, frontal spatium, scrobe,

scapula dorsally, longitudinal line on posterior margin of eyes; vestiture predominantly white; orange antennal flagellum except scape; wings darker with coppery reflection; abdomen with blue reflection.

**Measurements:** 1♂: 17.50 mm.

**Materials examined:** Panbang, Zhemgang (90.933E, 26.816N, Alt. 137 m): 1♂ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 15.iv.2016 from Manas river bank.

**Distributional record:** Bhutan, India & Myanmar (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

**14. *Scolia (Discolia) rugifrons* Betrem**

*Scolia (Scolia) rugifrons* Betrem, 1928: 273, Type ♀, Khasi Hills, Ranjit Valley, India; Pegu Hills, Myanmar (BMNH).

*Scolia (Discolia) rugifrons* Betrem: Betrem & Bradley, 1964b: 93.

**Diagnosis:** Black with following parts red: antennal flagellum entirely, frontal spatium, front, vertex; vestiture black except on head region reddish brown; wings dark brown with purplish reflection.

**Measurements:** 2♀: 20.05-24.69 mm.

**Materials examined:** Kanglung, Trashigang: 2♀ collected by Phurpa Dorji & Tshering Nidup on 28.ix.2015 and 25.vii.2016 from Sherubtse College Campus.

**Distributional record:** Bhutan, India & Myanmar (Gupta & Jonathan, 2003; Kumar & Pham, 2015)

**Note:** New record for Bhutan.

**15. *Scolia (Discolia) clypeata rufuhirta* Betrem**

*Scolia (Scolia) vollenhoveni rufohirta* Betrem, 1928: 290, Type ♀, India: Kumaon, Kousanie (NZC).

*Scolia (Discolia) clypeata rufohirta* Betrem: Betrem & Bradley, 1964b: 92.

**Diagnosis:** Black with following parts reddish yellow: median elevated parts of clypeus, frontal area, antennal flagellum except scape, frontal spatium except frontal lamina, frons and vertex including declivous portion, temples above, scapula entirely on dorsal portion; vestiture black except red on head, scapulae, mesoscutum anteriorly, fore legs, ventral side of thorax.

**Measurements:** 1♀: 20.39 mm.





**Fig. 13:** *Scolia (Discolia) elizabethae* (♂)



**Fig. 16:** *Scolia (Discolia) venusta* (♀)



**Fig. 14:** *Scolia (Discolia) rugifrons* (♀)



**Fig. 17:** *Scolia (Discolia) dehraensis* (♀)



**Fig. 15:** *Scolia (Discolia) clypeata rufuhirta* (♀)



**Fig. 18:** *Liacos erythrosoma* (♂)

**Materials examined:** Nganglam, Pema Gatshel (91.233E, 26.816N, Alt. 349 m): 1♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup from the bamboo field in Alabari village on 17.iv.2016.

**Distributional record:** Bhutan, India & Nepal (Gupta & Jonathan, 2003; Kumar & Pham, 2015).

**Note:** New record for Bhutan.

**16. *Scolia (Discolia) venusta* Smith**



*Scolia venusta* Smith, 1855: 90. Types ♀, ♂, India (OUM).

*Scolia (Discolia) venusta* Smith: Bradley & Betrem, 1967: 324.

**Diagnosis:** Black except legs and tegula ferruginous; following parts yellow: transverse elongated mark on front, elongated mark along outer eye margin, II tergite anterior three fourth except on sides, large paired spots on III tergite narrowly separated in the middle, IV tergite with two spots laterally; vestiture reddish golden; wings yellowish with darker at apex.

**Measurements:** 2♀: 17.64-23.55 mm.

**Materials examined:** Wang Sisina, Thimphu: 1♀ collected by Tshering Nidup & Wim Klein on 03.viii.2016 from the side of Thimphu-Phuntsholing highway; Lungtenphu, Thimphu: 1♀ collected by G.G.M. Schulten on 20.xi.1994.

**Distributional record:** Bhutan, India, Myanmar & Nepal (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

#### 17. *Scolia (Discolia) dehraensis* Betrem

*Scolia (Discolia) dehraensis* Betrem, 1928: 9. Type ♂, Dehra Dun, India (RMNH).

*Scolia (Discolia) dehraensis* Betrem: Gupta, 1997: 99.

**Diagnosis:** Black with following parts yellow: broad mark on front, two small lateral spots on II tergite, two large lateral spots on III tergite; vestiture entirely reddish brown; wings yellowish hyaline with forewing fuscous apically.

**Measurements:** 1♀: 15.76 mm.

**Materials examined:** Kanglung, Trashigang: 1♀ collected by Phurpa Dorji & Tshering Nidup on 25.vii.2016 from paddy field in Thrangom village.

**Distributional record:** Bhutan & India (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

#### 18. *Liacos erythrosoma erythrosoma* (Burmeister)

*Scolia erythrosoma* Burmeister, 1854: 15. Type ♂: Pedang, Sumatra (HSMP).

*Liacos erythrosoma erythrosoma* (Burmeister): Micha, 1927: 55-58.

**Diagnosis:** Forewing with two recurrent veins where second recurrent coalescent with first before reaching cubital vein; three cubital veins;

black with following parts bright red: II to VII tergite except black triangular mark in II medially; vestiture bright red on red parts; wings dark brown.

**Measurements:** 1♂: 17.61 mm.

**Materials examined:** Panbang, Zhemgang (90.933E, 26.833N, Alt. 113 m): 1♂ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 17.iv.2016 from Andhala Thang, confluence of Drangme Chhu and Mangde Chhu.

**Distributional record:** Bhutan, India, Sumatra, Java, Malaysia, Thailand, Myanmar, Sri Lanka, Taiwan, China, Korea & Nepal (Gupta & Jonathan, 2003).

**Note:** New record for Bhutan.

#### Discussion

Previously three species, namely, *Scolia (Discolia) sikkimensis* Bingham, *Sericocampsomeris stygia stygia* (Illiger) and *Megacampsomeris asiatica himalayana* (Betrem) were reported from Bhutan, however, we could confirm the occurrence of only *Megacampsomeris asiatica himalayana*. The other two previously reported species are doubtful since we could not acquire any of the exact collection locality data. Many of the species were collected from Sikkim which was confused to be part of Bhutan in many of the old literatures. During the present study, we identified 18 species of scoliid wasps from Bhutan of which 17 species are new record for the country.

#### Acknowledgements

This work would not have been completed without the fund from Bhutan Trust Fund for Environmental Conservation (BT FEC), Thimphu and National Biodiversity Center (NBC), Serbithang for coordinating the project. We also thank Mr. Thinley Gyeltshen for his selfless contribution in collecting the specimens.

#### References

- Betrem, J.G. 1928. Monographie der Indo-Australischen Scoliiden mit zoogeographischen Betrachtungen. Treubia, 9(supplementary): 1-388.
- Betrem, J.G. and Bradley, J.C. 1964a. Annotations on the genera *Triscolia*,



- Megascolia* and *Scolia*. Zoologische Mededelingen 39: 433-444.
- Betrem, J.G. and Bradley, J.C. 1964b. Annotations on the genera *Triscolia*, *Megascolia* and *Scolia* (Hymenoptera: Scoliidae) (Second part). Zoologische Mededelingen 40: 89-96.
- Betrem, J.G. and Bradley, J.C. 1972. The African Campsomerinae (Hymenoptera, Scoliidae). Monografieën van de Nederlandse Entomologische Vereniging 6: 1-326.
- Bingham, C.T. 1896. On some exotic fossorial Hymenoptera in the collection of the British Museum, with descriptions of new species, and of a new genus of Pompilidae. Journal of the Proceedings of the Linnean Society Zoology 25: 422-445.
- Bingham, C.T. 1897. Fauna of British India, including Ceylon and Burma, Hymenoptera, I. Wasps and Bees. London: Taylor and Francis, 579+i-xxix.
- Bradley, J.C. 1972. Scoliid types in the Museum für Naturkunde of the Humboldtuniversität zu Berlin. Mitteilungen aus dem Zoologischen Museum in Berlin 48(1): 3-19.
- Bradley, J.C. 1974. The types of Scoliidae (Hymenoptera) described by Henri de Saussure or by Jules Sichel, or by them jointly. Revue suisse de Zoologie 81(2): 417-485.
- Bradley, J.C. and Betrem, J.G. 1967. The types of Scoliidae described by Frederick Smith (Hymenoptera). Bulletin of the British Museum (Natural History). Entomology 20(7): 287-327.
- Burmeister, H.C.C. 1854. Bemerkungen über den allgemeinen Bau und die Geschlechtsunterschiede bei den Arten der Gattung *Scolia* Fabr. Abhandlungen der Naturforschenden Gesellschaft zu Halle 1(4): 46 pp.
- Fabricius, J.C. 1775. Systema entomologiae, Sistens, insectorum classes, ordines, genera, species, adiectis, synonymis, locis, descriptionibus, observationibus. Kortii: Flensburgi et Lipsiae 832pp.
- Fabricius, J.C. 1793. Entomologia Systematica Emendata et acuta. Secundum, Classes, Ordines, Genera, Species, Adiectis Synonymis, Locis, Observationibus, Descriptionibus 2. Hafniae, viii+519pp.
- Fabricius, J.C. 1804. Systema Piezatorum secundum ordines, genera, species, synonymis, locis, observationibus, descriptionibus. Reichard: Brunsvigae 439 pp.
- Gupta, S.K. 1997. Hymenoptera: *In*: Fauna of Nanda Devi Biosphere Reserve: Fauna of Conservation Areas, 9. Zoological Survey of India: 97-104.
- Gupta, S.K. and Jonathan, J.K. 2003. Fauna of India and the adjacent countries, Hymenoptera: Scoliidae. Zoological Survey of India: 1-277.
- Jadhav, M., Girish Kumar, P. and Gaikwad, S.M. 2014. A new record of *Scolia* (*Discolia*) *fasciatopunctata dunensis* Betrem (Insecta: Hymenoptera: Scoliidae) from the Western Ghats of Maharashtra, India. Journal of Threatened Taxa 6(14): 6715-6718.
- Kim, J.K. 2009. Taxonomic Review of the Tribe Campsomerini (Scoliinae, Scoliidae, Hymenoptera) in Korea. Korean Journal of Systematic Zoology 25(1): 99-106.
- Krombein, K.V. 1978. Biosystematic studies of Ceylonese wasps, II: A monograph of the Scoliidae (Hymenoptera: Scoliidae). Smithsonian Contributions to Zoology 238: 1-56.
- Kumar, G.P. 2009a. Taxonomic notes on Hairy Wasps (Hymenoptera: Scoliidae) of Andhra Pradesh, India. Records of the Zoological Survey of India 109 (Part-1): 97-103.
- Kumar, G.P. 2009b. New Record of *Megascolia* (*Regiscolia*) *azurea christiana* (Betrem & Guiglia) (Hymenoptera: Scoliidae) from Mizoram, Orissa and Sikkim, India. Records of the Zoological Survey of India 109 (Part-1): 105-107.
- Kumar, G.P. 2015. Insecta: Hymenoptera: Scoliidae. Fauna of Uttar Pradesh, State Fauna Series 22 (Part-2): 573-580.
- Kumar, G.P. and Pham, P.H. 2015. New Distributional Records of Scoliid Wasps (Insecta: Hymenoptera: Scoliidae) from India. Records of the Zoological Survey of India 115 (Part-4): 325-334.
- Kumar, G.P. and Sharma, G. 2015. Scoliid fauna (Insecta: Hymenoptera: Scoliidae) of



**New record of scoliid wasps (Hymenoptera: Scoliidae: Scoliinae) from Bhutan**

- Rajasthan. *In*: Animal Diversity, Natural History and Conservation, Vol. 4, (eds.) V. K. Gupta & Anil K. Verma. New Delhi: Daya Publishing House, 95-105pp.
- Magretti, P. 1892. Imenotteri; Viaggio de Leonardo Fea in Birmanicae Regioni vicini 43, parte prima Mutilledei Scollidei Tiphidae. Annali del Museo civico di Storia Naturale Geneva 12: 97-266.
- Micha, I. 1927. Beitrag zur Kenntnis der Scoliiden. Mitteilungen aus dem Zoologischen Museum in Berlin 13(1): 1-156, 42 figures.
- Saussure, H. de. 1858. Description de diverses especes nouvelles ou peu connues du genre *Scolia*. Annales de la Société Entomologique de France 6(3): 193-249.
- Smith, F. 1855. Mutillidae and Pompilidae. *In*: Catalogue of the Hymenopterous Insects in the collection of the British Museum 3: 206 pp., 5 plates.
- Tsuneki, K. 1972. Studies on the scoliid wasps of Eastern Asia (Hymenoptera). Etizenia 62: 1-41.



## A new species of the genus *Epistaurus* (Orthoptera: Acrididae) from Central India

\*Sunil Kumar Gupta and Kailash Chandra

Zoological Survey of India, Prani Vigyan Bhawan, 'M' Block, New Alipore, Kolkata-700053,  
West Bengal, India

(E-mail: skumarento@gmail.com)

### Abstract

*Epistaurus tinsensis* sp. n. is described from Chhattisgarh, India. A key to the species of the genus from India is also provided.

**Keywords:** *Coptacridinae*, short-horned grasshopper, taxonomy, new species, Chhattisgarh.

Received: 30 November 2016; Revised: 13 April 2017; Online: 17 May 2017.

### Introduction

The subfamily Coptacridinae includes small to medium sized short-horned grasshoppers, characterized by subconical head; angular occiput with vertex separated by a ridge; the pronotum without lateral carinae; conical prosternal process; open interspace of mesosternum; fully developed or reduced elytra and wings; presence of tympanum; short lower basal lobe of hind femur than upper; absence of external apical spine of hind tibia; presence of furcula at last abdominal tergite of male (in most cases); supra-anal plate mostly with attenuate apex and subgenital plate with transverse fold. Male cercus widened in basal and compressed in apical half with a ventral curvature and complicated shaped apex. They generally occur in high grasslands and open patches, open woodland, grazing fields, agricultural land and on shrubs. About 20 genera are globally known under the subfamily Coptacridinae (Eades *et al.*, 2016). Shishodia *et al.* (2010) reported 285 species under 135 genera of Acrididae from India, wherein 9 species under 4 genera of Coptacridinae subfamily are included.

Bolivar (1889) erected the genus *Epistaurus* on two species from Angola and Caconda (Anchieta) *Ep. crucigerus*, *Ep. signatus*. Later Johnston (1956) transferred *Ep. signatus* to *Eucoptacra signatus*. Presently 7 species of the genus i.e. *Ep. aberrans*, *Ep.*

*bolivar*, *Ep. crucigerus*, *Ep. diopi*, *Ep. meridionalis*, *Ep. sinetyi* and *Ep. succineus* have been reported globally and only one species *Ep. sinetyi* Bolivar (1902) had been described from Tamil Nadu (Trichinopoly), India.

### Material and Methods

**Study area:** The specimens were collected from Barnawapara Wildlife Sanctuary, Chhattisgarh, which lies between latitudes 21°18'45" to 21°30'N and longitudes 88°22'30" to 82°37'30"E, with an area of about 244.66 sq. km. The name of the wildlife sanctuary is derived from the twin hamlets villages of Bar and Nawapara, located at the heart of the forest. The vegetation of the sanctuary area was mainly tropical dry deciduous forest. The forest chiefly comprises of the straight stemmed grand teak *Tectona grandis* Linn. (Verbenaceae), sal *Shorea robusta* Roth. (Dipterocarpaceae), saja *Terminalia tomentosa* Roth. (Combretaceae), bija *Pterocarpus marsupium* Roxb. (Fabaceae), aonla *Emblica officinalis* Gaertn. (Euphorbiaceae) and palas *Butea monosperma* (Lamk.) (Fabaceae).

The specimens were dry preserved. Images of specimen were captured using Sony Digital Camera DSC-HX9V. The detailed morphological characters and measurements



were studied under Leica stereozoom Microscope (Leica M205 A) using the software Leica Application Suite (LAS V3.8).

## Result

### Taxonomical part

Order **Orthoptera** Olivier, 1789

Suborder **Caelifera** Ander, 1939

Infraorder **Acrididea** Macleay, 1821

Superfamily **Acridoidea** Macleay, 1821

Family **Acrididae** Macleay, 1821

Subfamily **Coptacrinae** Brunner von Wattenwyl, 1893

Genus *Epistaurus* Bolivar, 1889

**Genus** *Epistaurus* Bolivar, 1889

**Diagnosis:** Body size small, antennae filiform, frontal ridge narrow, widened between antennae, gradually narrowed at apex; between fastigium of vertex and occiput a deep transverse depression; pronotum strongly tectiform with high, ridge like median carina, which is interrupted by posterior transverse sulcus; male supra anal plate less attenuate and not truncate at apex; circus gradually conical apically with acute or subacute and curved ventral apex.

*Epistaurus tinsensis* Gupta and Chandra sp.n.

[urn:lsid:zoobank.org:act:F3F329C8-AE6E-4E06-B4C0-0F3E8132C06F](https://zoobank.org/urn:lsid:zoobank.org:act:F3F329C8-AE6E-4E06-B4C0-0F3E8132C06F)

**Diagnosis:** Body size small, pilose and pubescent. Antennae filiform. Pronotum punctuate, median carina of pronotum straight, lateral carina absent; tegmina and wings surpassing hind knee.

**Type material: Holotype:** ♀, 27.vii.2011, coll. S. K. Gupta & party, Reg. No 18702/H5 deposited in Zoological Survey of India, M-Block, New Alipore, Kolkata, India.

**Type locality:** INDIA: Chhattisgarh: Raipur District; Barnawapara Wildlife Sanctuary, Tinsa Pathar (21°27'50'' N, 82°27'36'' E), 524 m.

**Paratype:** 2 male and 1 female same data as holotype Reg. No. 18703-05/H5.

**Description of female:** Size small, body pilose, head very small, less than half length of pronotum, occiput very small, fastigium

Fig. 1



A



B

**Figure 1.** *Epistaurus tinsensis* sp. n. female: A. Dorsal view; B. lateral view.

longitudinally tricarinate with truncate apex, median carina continued behind over occiput and pronotal carina. Frontal ridge widest between antennae and narrowest beyond fastigial end. Antennae filiform, 20 segmented, subequal or slightly longer than head and pronotum together, mid segments 1.8 times longer than its width. Pronotum rugose, tectiform, with raised median carina, three transverse sulci present, interrupted by only posterior transverse sulci; lateral carina absent; prozona shorter than metazona. Prosternal spine short, conical; apex subacute. Mesosternal lobe wider than long; mesosternal interspace wider than long. Tegmina and wings developed. Tegmina exceeding hind knee of hind femora, opaque. Wings as long as tegmen. Abdomen carinated medially, tympanum developed, aperture large and oval. Hind femora slender, 3.5 times longer than its width, with large white hairs, lower carina of hind femur with two large



Fig. 2

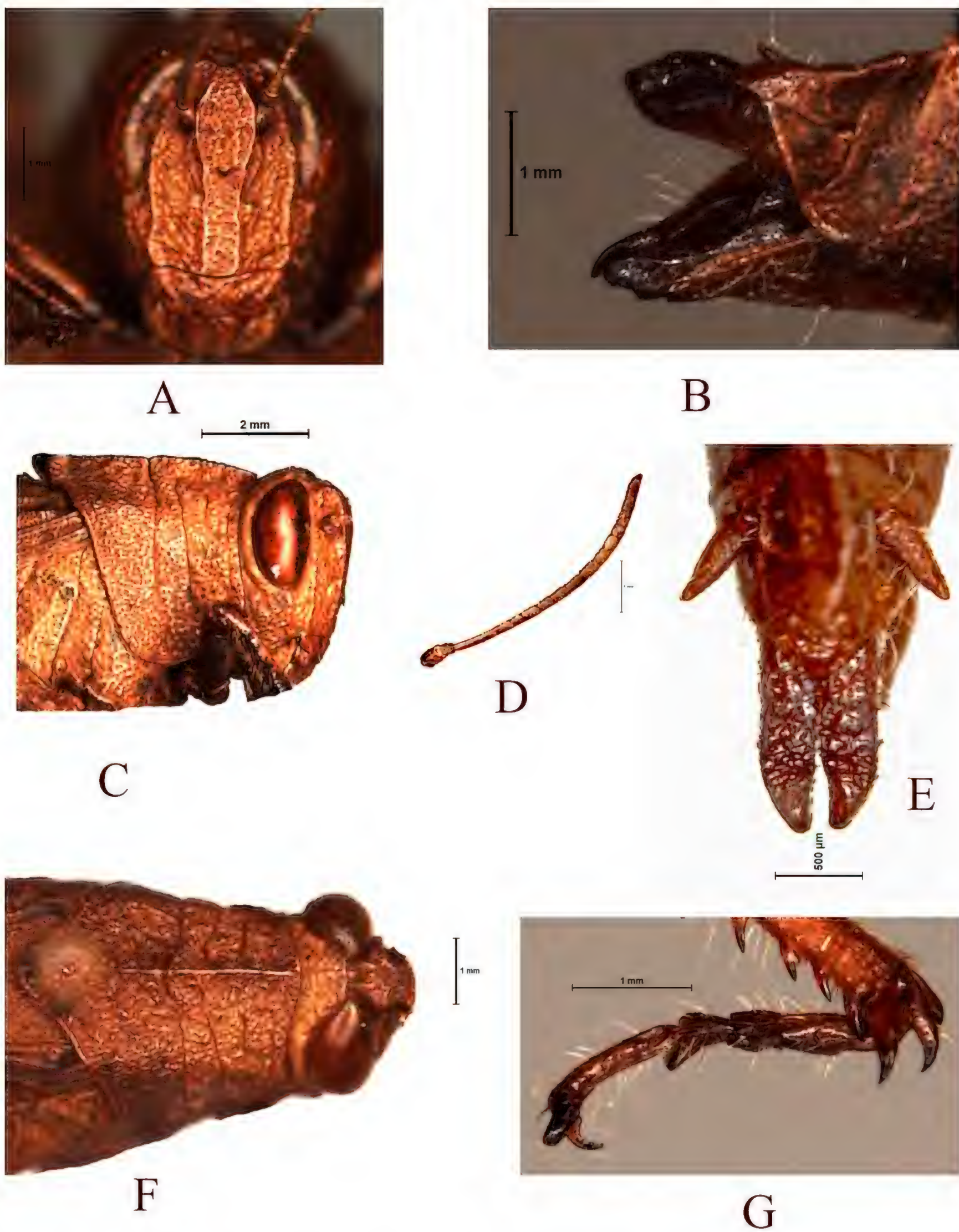


Figure 2. *Epistaurus tinsensis* sp. n. female: A. Frontal ridge; B. Ovipositor lateral view; C. Pronotum lateral view; D. Female antenna; E. Cerci and ovipositor dorsum view; F. Pronotum dorsum view; G. Pronotum hind tarsal segments.



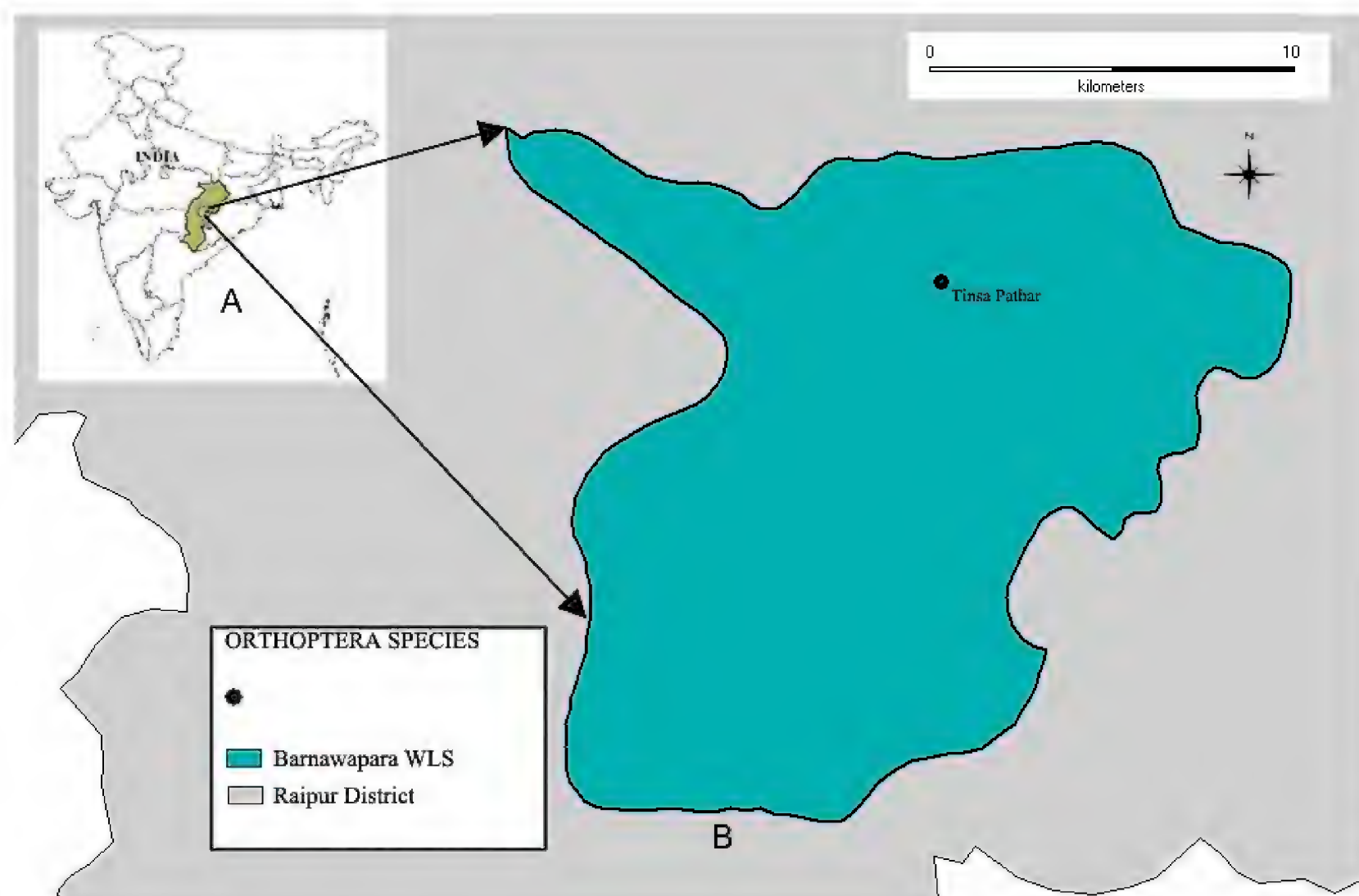


Figure 3. Collection locality of *Epistaurus tinsensis* sp. n. in Chhattisgarh, India.

dark blackish-brown patches, upper marginal areas with denticles. Hind tibiae with 9 to 10 external spines and 10 to 11 internal spines. Cercus long, slender with subacute apex, not completely reaching upto apex of supra-anal plate. Supra-anal plate tongue shaped. Subgenital plate subconical, with attenuate apex. Valves of ovipositor with short, robust, slightly curved apex.

**Male:** similar as female.

**Colouration:** Body yellowish brown with dense long silvery pubescence. Antennae brownish with apical segments darkened. Tegmina dark brownish with light brown spots. Wings yellowish hyaline. Pronotum posterior margin with a black spot. Hind femora with two reddish brown maculation in upper surface, lower carina of hind femur with two large blackish-brown patches; tibiae reddish brown with black tipped spines.

**Etymology.** This species is named after the collection locality of Tinsa Pathar, Chhattisgarh, India.

#### Key to the *Epistaurus* species from India

1. Tegmina and wings not exceeding hind knee of hind femora, median carina of pronotum strongly arcuate, with crest like, frontal ridge extended up to fastigium of vertex.....*E. sinetyi* Bolivar
- Tegmina and wings exceeding hind knee of hind femora, median carina of pronotum straight, frontal ridge not extended upto fastigium of vertex..... *E. tinsensis* sp. n.

**Measurements** (in mm): *Female*: Body length 17.69; head length 1.446; vertex length 0.621, interocular space 1.47, antennal length 5.70, Scape or basal antennal segment length 0.203, Pedicel length 0.256, length of I segment of flagellum 0.398; length of mid segment of antenna 0.375, width 0.199. Pronotum length 4.065; prozona length 1.95, metazona length 2.154, width 3.61. Tegmina length 12.974; abdomen length 7.512, width 1.945. Fore leg: femur length 1.264, width 0.565; tibial length 1.490, width 0.346; length of tarsus I- 0.408, II- 0.149; III- 0.793; length of claws I- 0.384, claws II- 0.27. Mid leg: femur length 2.301, width 0.691; tibial length 2.739, width 0.332; length of



tarsus I- 0.485, II- 0.269, III- 0.887. Hind leg: femur length 8.33, width 2.36; tibial length 7.96, width 0.40; length of tarsus I- 1.26, II- 0.428, III- 1.151; length of hind tibial outer spurs I 0.619, cerci length, 0.338.

**Male:** Body length 11.08; head length 0.994; vertex length 0.382, compound eye length 1.669, width 0.86; interocular space 0.195; episternum length, 0.650, width 0.34; Pronotum length 2.99; height, 2.670; prozona length 1.43, metazona length 1.254, mesosternal lobe length 0.564, width 0.751; tegmina length 9.421; Abdomen length 7.512, width 1.954. Fore leg: femur length 1.05; tibial length 1.599, length of tarsus I- 0.386, II- 0.366, III- 0.363; length of claws I- 0.238. Mid leg: femur length 2.369; tibial length 2.179, length of tarsus I- 0.325, II- 0.317, III- 0.645. Hind leg: femur length 5.769, width 2.103; tibial length 5.90, width 0.334; length of tarsus I- 0.903, II- 0.400, III- 0.922; claw length 0.329, length of outer spur I- 0.344, II 0.324.

**Discussion:** *Ep. tinsensis* **sp. n.** has resemblance with the other species of the genus, *Ep. sinetyi* Bolivar, 1902. The new described species is the second discovered species of the genus after *Ep. sinetyi* from India. *Ep. tinsensis* **sp. n.** differs from the *Ep. sinetyi* by the triangular vs. truncate fastigium of vertex and straight vs. arcuate median carina of pronotum.

**Conclusion:** After discussing the differential morphological characters it can be concluded that the presently described species collected from Central Indian forest during the rainy season is a novel species to the genus. *Ep.*

*tinsensis* **sp. n.** has light brownish colour in both sexes, live near to the dry leaves at hilly areas and is the seventh valid species of the genus *Epistaurus*.

### Acknowledgements

The authors are grateful to the officer-in-Charge and staff of Orthoptera section for the necessary facilities. The authors are also thankful to CAMPA, (Compensatory Afforestation Fund Management and Planning Authority), for funding the project.

### References

- Bolivar, I. 1889. Ortopteros de Africa del Museo de Lisboa (3). Journal de sciences mathematicas physicas e naturales (Ser. 2), 1: 150-173.
- Bolivar, I. 1902. Les Orthopteres de St. Joseph's College a Trichinopoly (Sud de l' Inde) 3 me. partie. Annals de la Societe entomologique de France 70: 580-635, pl.9.
- Eades, D.C., Otte, D., Cigliano, M.M. and Braun, H. 2016. Orthoptera Species File. Version 5.0./5.0. [accessed on October 10<sup>th</sup> 2016] <http://Orthoptera.SpeciesFile.org>
- Shishodia, M.S., Chandra, K. and Gupta, S.K. 2010. An annotated checklist of Orthoptera (Insecta) from India. Records of the Zoological Survey of India Occasional Paper 314: 1-366.
- Johnston, H.B. 1956. *Annotated catalogue of African grasshoppers*. Combridge University Press, Anti-Locust Res. Centre xxii+833pp.



# Search for the blind vampire: First record of *Eoctenes* Kirkaldy in Southern Luzon, (Hemiptera: Polyctenidae), with key to the Cimicoidea, ectoparasitic on bats in the Philippines

\*Ace Kevin S. Amarga<sup>1</sup> and Sheryl A. Yap<sup>1,2</sup>

<sup>1</sup>*Institute of Weed Science, Entomology, and Plant Pathology, College of Agriculture and Food Science, University of the Philippines Los Baños, Laguna, Philippines.*

<sup>2</sup>*Museum of Natural History, University of the Philippines Los Baños, Laguna, Philippines.*

(Email: [ace\\_amarga061@yahoo.com](mailto:ace_amarga061@yahoo.com))

## Abstract

Polyctenidae Westwood, also known as bat bugs, is a haematophagous group of hemipterans exclusively ectoparasitic on bats and is closely related to Cimicidae Latreille. These bugs are dorsoventrally flattened with conspicuous ctenidia, apterous, anophthalmus, possess well-developed legs, and reproduce via pseudoplacental viviparity. They are rare compared to other insect taxa ectoparasitic on bats as evinced by a relatively small number of museum collections and described taxa. Worldwide, it is represented by 2 subfamilies, 5 genera, and 32 species. In the Philippines, it is only represented by two species from the genus *Eoctenes* Kirkaldy: *E. spasmae* (Waterhouse) and *E. intermedius* (Speiser). The first Philippine record for the genus was reported in 1961 from Northern Luzon. This paper presents the first record of *Eoctenes* in Southern Luzon, with key to the Cimicoidea ectoparasitic on bats in the Philippines.

**Keywords:** *Cimicoidea*, *Eoctenes*, new record, *Polyctenidae*, Southern Luzon.

Received: 14 February 2017; Revised: 1 May 2017; Online: 10 May 2017.

## Introduction

A fraction of species from Cimicoidea (Hemiptera: Cimicomorpha) are known to be sanguinivorous in nature (Ryckman *et al.*, 1981; Maa, 1961, 1964). These parasitic species belong to the families Cimicidae Latreille and Polyctenidae Westwood which are known to occur in both the Old and New World. All species belonging to Cimicidae are known to as obligatory ectoparasites on various avian (Boyd, 1951; Loyer and Regan, 1991) and mammalian taxa (Balvin, 2008) ranging from bats (Wilson and Galloway, 2002; Reeves *et al.*, 2005; Balvín *et al.* 2014) to humans (Booth *et al.*, 2012). However, members of the family Polyctenidae tend to display a narrow host specificity. They are known to be only associated with bats (Mammalia: Chiroptera) (Ferris and Usinger, 1939).

Polyctenidae is a small group of bat

bugs comprising of subfamilies Polycteninae Maa which is endemic to the Old World, and Hesperocteninae Maa which is confined in the New World (Maa, 1964). The former is further subdivided to 4 genera: *Adroctenes* Jordan, *Eoctenes* Kirkaldy, *Hypoctenes* Jordan, and *Polyctenes* Giglioli whereas the latter is only represented by the *Hesperoctenes* Kirkaldy (Ryckman and Casdin, 1977). Polyctenid bugs tend to prefer microchiropterans as host than megachiropterans (Pteropodidae) (Marshall, 1982). Currently, there are 32 species that are known worldwide (Ryckman and Sjogren, 1980).

As compared to other ectoparasitic insects on bats, polyctenid bugs can be considered rare. This claim of rarity can be supported by relatively small number of museum collections and described taxa. The last



described species of Polyctenidae was from the Aldabra group of islands in Seychelles (Maa, 1970). In the Philippines, the first recorded polyctenid bug is a single female specimen of *Eoctenes spasmae* (Waterhouse) from *Megaderma spasma* (Linnaeus) in Bucay, Abra Province, Northern Luzon (Maa, 1961). Herein, we present the first record of the genus *Eoctenes* Kirkaldy in Bicol Peninsula, Southern Luzon along with the key to the Cimicoidea ectoparasitic on bats in the Philippines.

## Materials and Methods

Bats were collected using a mobile mist netting (3 x 2.5 m) inside the cave. Fine-tipped forceps were used to carefully obtain the polyctenid bugs on the pelage of the bat host. Collected polyctenid specimens were temporarily placed in the Eppendorf vial containing 90% ethanol prior to identification. Specimens were cleared using 10% potassium hydroxide (KOH) for 24 hours and mounted on slide using Canada balsam. Specimens were examined using Leica DM 4000M versatile upright microscope and was photographed using Canon D5500. Specimens were identified using available keys from published literature. Voucher material will be deposited in Crop Protection Cluster Insect Taxonomy Laboratory.

## Key to the Cimicoidea ectoparasitic on bats in the Philippines

1. Eyes present; antennae longer than pronotum; thoracic ctenidia absent.....2
- Eyes absent; antennae shorter than pronotum; thoracic ctenidia present..... 3
2. Tibiae I-III with apical tufts; hemelytral pad rounded at all aspect; parameres bent at apex .....*Cacodmus sumatrensis* Ferris & Usinger
- Tibia III without apical tufts; hemelytral pad rounded except for straight inner margin; parameres evenly bent and tapering.....*Loxaspis seminitens* Horvath
3. Apical membranous lobe of tibia I subcylindrical; abdominal tergite VII-VIII bearing no complete bristle rows .....*Eoctenes intermedius* (Speiser)
- Apical membranous lobe of tibia I conical; abdominal tergite VII-VIII bearing complete

row of curved bristles .... *Eoctenes spasmae* (Waterhouse)

## Genus *Eoctenes* Kirkaldy, 1906

*Eoctenes* Kirkaldy, 1906: 375.

**Type species:** *Polyctenes spasmae* Waterhouse, 1879: 312.

## *Eoctenes spasmae* (Waterhouse, 1879)

### Figure 1-2

*Polyctenes spasmae* Waterhouse, 1879: 312.

*Eoctenes spasmae* Kirkaldy, 1906: 375.

**Diagnosis:** *Eoctenes spasmae* is closely similar to *E. sinae* Maa by virtue of the following sets of taxonomic characters: denticles on anterior ctenidium on antennal segment I rather regularly arranged; genal comb reaching the posterolateral angle of head; rostrum 4 segmented; posterior margin of hypostoma bearing long and strong setae; mesonotum shorter than wide but subequal in length with reference to pronotum; intercoxal process of prosternum triangular, subacute; posterior margins of abdominal tergite VII- VIII bearing complete row of long setae. However, *E. spasmae* differs from the latter by having a longer labrum, antennal segment III and IV subequal in length, submedian line of hypostomal region bearing fine setae, antero-interior margin of coxa I bearing 4 stout abd 2-3 fine setae, legs II and III long and narrow, and abdominal sternites bearing numerous setae (Maa, 1961, 1964).

**Description:** Head capsule anteriorly rounded; posterolateral angle of the head capsule acute slightly reaching the anterolateral angle of pronotum; antennae short; anterior ctenidium of antennal segment I evenly arranged in an arcuate line; dorsal comb on antennal segment II absent; genal comb extending to the posterior angle of the head capsule; lateroventral margin of labrum bearing 4 setigerous tubercles; rostrum 4 segmented; submedian line of hypostoma bearing few fine setae; posterior of hypostomal region bearing 15 setae arranged in 2-3 rows; pronotum subquadrate, as long as wide; denticles on pronotum shorter than denticles on mesonotum; mesonotum shorter than wide; comb on mesonotal lobe pronounced; mesonotal denticles shorter than occipital denticles;





Figure 1. Habitus in dorsal profile of female (A) and male (B) *Eoctenes spasmae* (Waterhouse).  
Scale= 200x.

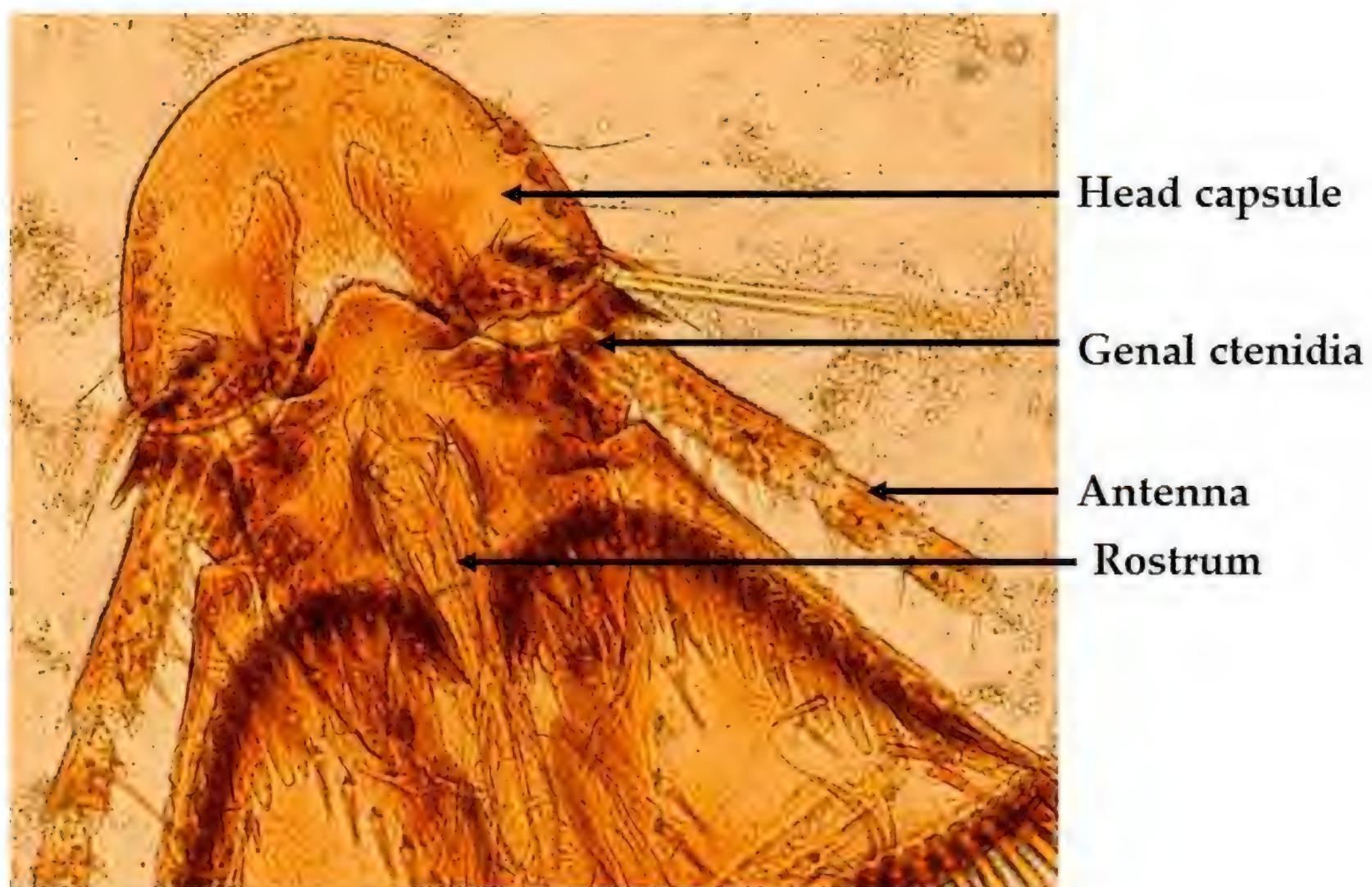


Figure 2. Head of *E. spasmae* (Waterhouse). Scale= 200x.



metanotum pronounced; legs subequal, leg I shorter than legs II and III; intercoxal process of sternum subacute; apical membranous lobe of tibia I conical; peg-like setae on tarsi II and III absent; abdominal tergite VII and VIII bearing complete row of long, curved bristles; lateral bristles on abdomen conspicuous; abdominal sternite bearing numerous setae.

**Material examined:** PHILIPPINES: LUZON: 5♂, 7♀, Albay, Batan Island, Brgy. Lagundi, 21-vi-2014, ex. *Megaderma spasma* (Linnaeus), A. K. S. Amarga leg.

**Distribution:** India, Indonesia (Borneo, Java, Karimata Islands, Sumatra), Malaysia, Philippines (Luzon: Abra; Bicol Peninsula, **new record**), Sri Lanka, Thailand.

**Remarks:** Maa (1961) noted a variability on the length of occipital, pronotal, and mesonotal denticles. Moreover, *E. spasmae* is known to be distributed in the Indo-Malayan ecoregion particularly in Southeast Asia. Such geographic distribution coincides with the distribution of its true host *Megaderma spasma*.

## Discussion

Currently, there are four species under Cimicoidea known to be associated with Chiroptera in the Philippines: *Cacodmus sumatrensis* Ferris & Usinger, *Eoctenes intermedius* (Speiser), *Eoctenes spasmae* (Waterhouse), and *Loxaspis seminitens* Horvath.

The bat bugs, *C. sumatrensis* and *L. seminitens*, belongs to the subfamily Cacodminae, a group known to occur in the Old World particularly in Indo-Malayan and Afrotropical ecozone (Coetzee and Segerman, 1992; Kock *et al.*, 1998). *C. sumatrensis* was first described in 1957 from a *Galeopithecus* (now *Galeopterus* Thomas), a genus of flying lemur in the island of Sumatra. Kock and Aellen (1987) stated that bats are the true host for this species and its occurrence on flying lemur is erroneous. In the Philippines, this species was recorded on *Miniopterus* sp. (Zipagan, 1990). Furthermore, *C. sumatrensis* is recorded from Indonesia (Java, Sumatra), Malaysia, and Philippines (Laguna) (Ford, 1979; Ryckman *et al.*, 1981; Zipagan, 1990). Of the three *Loxaspis*

Rothschild (the other two are *L. malayensis* Usinger from Malaysia, and *L. spinosa* Usinger from Borneo) occurring in the Indo-Malayan ecoregion (Ford, 1979; Ryckman *et al.*, 1981), only *L. seminitens* was documented in the Philippines. The first specimen of *L. seminitens* in the Philippines was collected in *Chaerephon plicatus* (Buchanan) from Rizal, Luzon Island (Zipagan, 1990).

The expanse of the distribution of genus *Eoctenes* encompasses five ecozone: Palearctic, Indo-Malaya, Afrotropics, Australasia, and Oceania. Among its seven species, only two are found in the Philippines: *E. spasmae* and *E. intermedius*. The former is widespread in Southeast Asia and can be considered as Indo-Malayan endemic whereas the latter has a wider distribution range (found in Indo-Malaya, Afrotropics, and Australasia). Furthermore, the first record of *E. intermedius* in Philippines was from a single specimen collected from Montalban, Rizal in 1961 (Maa, 1964).

The true breeding host of *E. spasmae* is *M. spasma* (Chiroptera: Megadermatidae), however, certain cases of accidental occurrences can be observed as in the case of its presence on *Megaderma lyra* Geoffroy, *Nycteris javanica* Geoffroy, and *Cynopterus sphinx* (Vahl) (Speiser, 1909; Maa, 1961, 1964). On the other hand, the true host of *E. intermedius* are *Taphozous* species (Maa, 1964). Its documentation on *Rhinolophus* and *Rousettus* needs further confirmation if it is accidental occurrence or cross contamination (Maa, 1961).

## Acknowledgement

The authors are grateful to DOST-ASTHRDP- NSC for the financial support; to the officials of Brgy. Lagundi and MacIlan Bechayda, for the accommodation and aid in the fieldwork; and to Dr. Jessamyn Adorada, for the use of Leica DM 4000M versatile upright microscope.

## References

- Balvín, O. 2008. Revision of the West Palearctic Cimex species. Preliminary report. Bulletin of Insectology 61(1): 129-130.
- Balvín, O., Bartonička, T., Simov, N., Paunović, M. and Vilímová, J. 2014. Distribution and



- host relations of species of the genus *Cimex* on bats in Europe. *Folia Zoologica* 63(4): 281-289.
- Booth, W., Saenz, V.L., Santangelo, R.G., Wang, C., Schal, C. and Vargo, E.L. 2012. Molecular markers reveal infestation dynamics of the bed bug (Hemiptera: Cimicidae) within apartment buildings. *Journal of Medical Entomology* 49(3): 535-546.
- Boyd, E.M. 1951. The external parasites of birds: a review. *The Wilson Bulletin* 63(4): 363-369.
- Coetzee, M. and Segerman, J. 1992. The description of a new genus and species of cimicid bug from South Africa (Heteroptera: Cimicidae: Cacodminae). *Tropical Zoology* 5: 229-235.
- Ferris, G.F. and Usinger, R.L. 1939. The family Polycetenidae (Hemiptera: Heteroptera). *Microentomology* 4: 1-50.
- Ferris, G.F. and Usinger, R.L. 1957. Notes on and descriptions of Cimicidae (Hemiptera). *Microentomology* 22(1): 1-37.
- Ford, L. 1979. The phylogeny and biogeography of the Cimicoidea (Insecta: Hemiptera). University of Connecticut, M.S. thesis 96 pp.
- Kirkaldy, G.W. 1906. Notes on the classification and nomenclature of the hemipterous Superfamily Miroidea. *Canadian Entomologist* 38(11): 369-376.
- Kock, D. and Aellen, V. 1987. Cimicidae parasites de Chiroptera du Muséum de Genève (Insecta: Hemiptera). *Revue Suisse de Zoologi* 94(4): 873- 879.
- Kock, D., Happold, D.C.D. and Happold, M. 1998. Cimicidae and Polycetenidae from Malawian Chiroptera. *Seckenbergiana biologica* 77(2): 235-239.
- Loye, J. and Regan, T.W. 1991. The cliff swallow bug *Oeciacus vicarious* (Hemiptera: Cimicidae) in Florida: ectoparasite implications for hole- nesting birds. *Medical and Veterinary Entomology* 5(4): 511-513.
- Maa, T.C. 1961. Records and descriptions of Polycetenidae (Hemiptera). *Pacific Insects* 3(1): 1-10.
- Maa, T.C. 1964. A review of the Old World Polycetenidae. *Pacific Insects* 6(3): 494-516.
- Maa, T.C. 1970. A new *Hypoctenes* from the Aldabra Atoll with notes on other species and a key to adults and nymphs of the genus (Hemiptera: Polycetenidae). *Journal of Medical Entomology* 7(6): 736-744.
- Marshall, A.G. 1982. The ecology of the bat ectoparasite *Eoctenes spasmae* (Hemiptera: Polycetenidae) in Malaya. *Biotropica* 14(1): 50-55.
- Reeves, W.K., Loftis, A.D., Gore, J.A. and Dasch, G.A. 2005. Molecular evidence for novel *Bartonella* species in *Trichobius major* (Diptera: Streblidae) and *Cimex adjunctus* (Hemiptera: Cimicidae) from two southeastern bat caves, U.S.A. *Journal of vector Ecology* 30(2): 339- 341.
- Ryckman, R.E. and Casdin, M.A. 1977. The Polycetenidae of the World, a checklist with Bibliography. *California Vector Views* 24(7-8): 25-31.
- Ryckman, R.E. and Sjogren, R.D. 1980. A catalogue of the Polycetenidae. *Bulletin of the Society of Vector Ecologists* 5: 1-22.
- Ryckman, R.E., Bentley, D.G. and Archbold, E.F. 1981. The Cimicidae of the Americas and oceanic islands, a checklist and bibliography. *Bulletin of the Society of Vector Ecologists* 6: 93-142.
- Speiser, P. 1909. The hemipterous family Polycetenidae. *Indian Museum Records (Calcutta)* 3: 271- 274.
- Wilson, N.A. and Galloway, T.D. 2002. The occurrence of the bat bug, *Cimex pilosellus* (Horváth) (Hemiptera: Cimicidae), in Manitoba, Canada. *Proceedings of the Entomological Society of Manitoba* 58: 5-7.
- Zipagan, M. 1990. Insect ectoparasites of vertebrates in the Philippines. University of the Philippines Los Baños, M.S.Thesis 240 pp.



## First record of *Podothrips erami* (Thysanoptera: Tubulifera) from India

Devkant Singha, Kaomud Tyagi and Vikas Kumar\*

Centre for DNA Taxonomy, Molecular Systematics Division, Zoological Survey of India,  
Kolkata, West Bengal, India.

(Email: [vikaszi77@gmail.com](mailto:vikaszi77@gmail.com))

### Abstract

*Podothrips erami* Minaei is a recently described species from Fars province of southern Iran. This is the first record of *Podothrips erami* from India after its original description.

**Keywords:** First record, *Podothrips erami*, Tubulifera, India.

Received: 2 February 2016; Revised: 12 April 2017; Online: 17 May 2017.

### Introduction

Thrips are fringed wings insects, ranging from 1 to 15 mm in size. The insect order Thysanoptera is classified into two suborders with 9 families (ThripsWiki, 2016). Approximately 3500 species are known in the family Phlaeothripidae across the globe (ThripsWiki, 2016). Out of these, 430 species are recorded from India (Tyagi and Kumar, 2016a). The members of this diverse family Phlaeothripidae exhibit a wide array of habitat from leaf feeders to fungus and spore feeders. Few of them are recorded as gall inducers, predators and kleptoparasites (Crespi and Abbot, 1999). The grass-living genus *Podothrips* Hood is known by 31 species so far (ThripsWiki, 2016), of which 10 species reported from India (Tyagi and Kumar, 2016a). The members of the genus are recorded as obligate predators and usually associated with scale insects on the members of plant family Gramineae (Palmer and Mound, 1991). A key to 19 species of *Podothrips* was provided by Ritchie (1974) which includes 8 species from India. *Podothrips* species have basantral plates which are longer than broad in contrast to other typical Phlaeothripids. *Podothrips erami* Minaei is a recently described species from Fars province of Iran. Recently, specimens of this species are collected from Rajasthan state of India. The purpose of this paper is to record *Podothrips erami* for the first time from India.

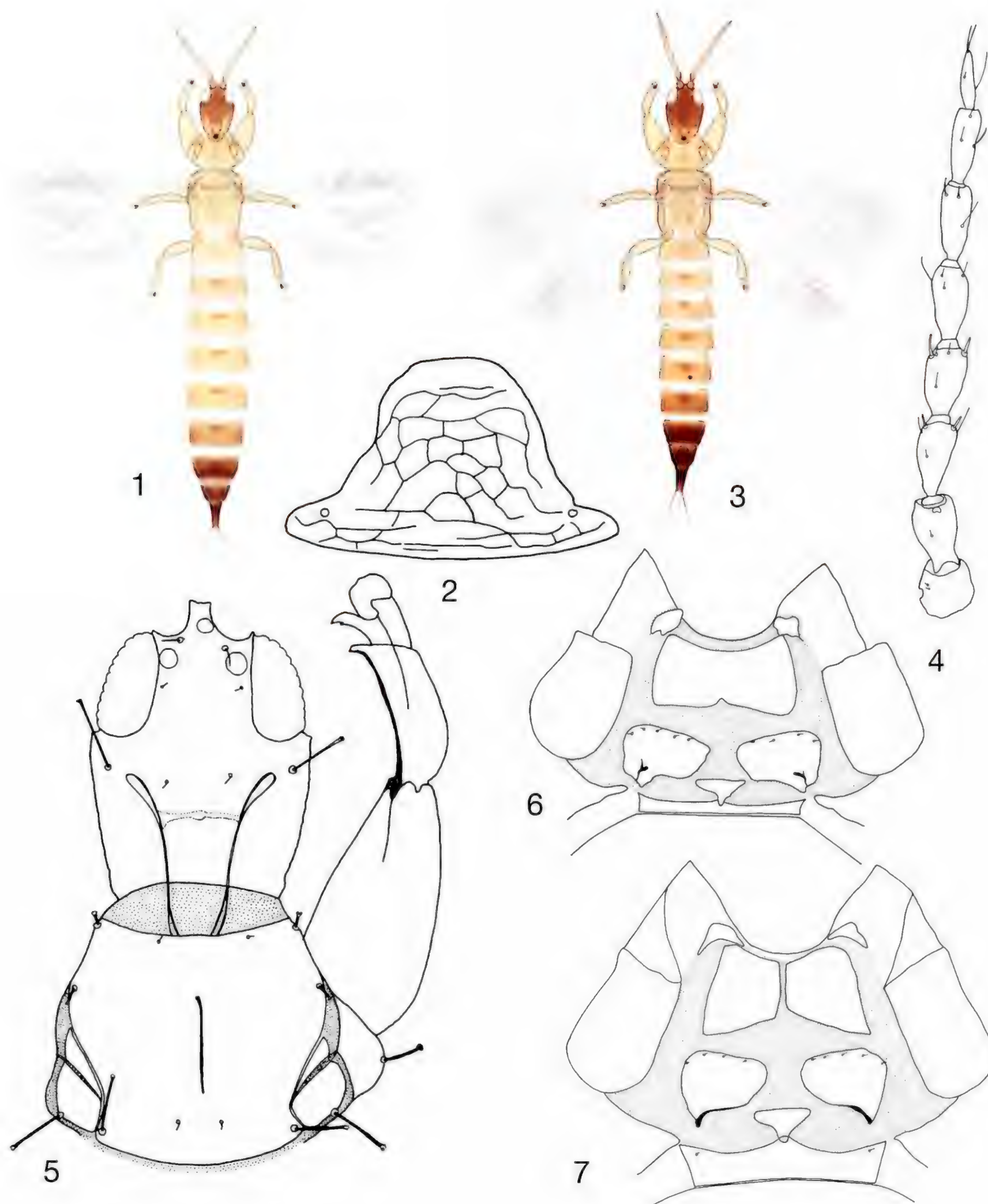
### Materials and Methods

Specimen collection, DNA isolation and amplification of partial fragment of mt COI gene were performed as detailed in Tyagi and Kumar (2016b). Voucher specimen was retrieved and slide mounted in Canada balsam for morphological examination. PCR product was purified from the Agarose gel using Qiagen Gel Purification Kit as per manufacturer's instructions. Sequencing of purified PCR product was carried out in both directions using 48-capillary Genetic Analyzer (Applied BioSystems ABI 3730) using BigDye® Terminator Cycle Sequencing Kit (v3.1) at sequencing facility of Zoological Survey of India, Kolkata. The generated forward and reverse COI fragments of *Podothrips erami* were analysed with SeqScape software version 2.7 (Applied Biosystems) and consensus sequences were obtained after checking deletion, insertion and stop codons. The generated sequence was submitted to BOLD (Barcode of Life Database) under the project titled "DNA Barcoding Thrips of India". The photographs were taken through a Leica Trinocular Microscope (Leica DM-1000) and using Leica software application suite (LAS EZ 2.1.0).

*Podothrips erami* Minaei  
(Figs 1-7)

*Podothrips erami* Minaei 2015: 959.





Figures 1-7: *Podothrips erami* 1. Female; 2. Pelta, female; 3. Male; 4. Antenna, female; 5. Head and pronotum with leg, female; 6. Prosternum, male; 7. Prosternum, female.

**Description:** This species can be easily recognised by the following characters; Body bicoloured. Head, antennal segment I, basal half of II, abdominal segments VIII-X brown,

abdominal segments III-VII with a brown area anteriorly, remaining part yellow. Fore wing pale. Major body setae pale. Head longer than broad, with a distinct tooth just behind the eyes,



postocular setae well developed, weakly expanded apically; maxillary stylets one third of head width apart, maxillary bridge present. Antennae 8-segmented, segment II with campaniform sensilla apically, III and IV each with 2 sense cones. All pronotal setae well developed, expanded apically except anteromarginal setae. Notopleural sutures complete. Basantral plates longer than broad. Mesopresternum boat shaped. Metathoracic sternopleural sutures present. Fore tibia with a sub apical tubercle, fore tarsus with a prominent tooth. Fore wing with 4-5 duplicated cilia. Pelta bell-shaped. Abdominal tergites II-VII with 2 pairs of wing retaining setae. Tube shorter than head, anal setae longer than tube.

**Remarks:** In most of the Phlaeothripids, the basantral plates when present are separated from each other. In male specimen of *P. erami*, the basantral plates are united in contrast to type specimens (Kambiz Minaei per. Commun.) but in female these plates are separated. In second male the antennae is 7-segmented. The aberration of the basantral plates and 7-segmented antennae may be due to incomplete development.

**Material studied:** One male, INDIA: Rajasthan, Jaipur, 21.xii.2014, wheat crop, coll. Vikas, Kaomud & Devkant (Reg. No. 7897/H17); Two females and two males, Rajasthan, Sawai Madhopur, Ranthambore National Park, 3.iv.2016, grass clumps, coll Vikas (Reg. No. 7449/H17, 7636/H17, 7646/H17 to 7647/H17).

**Distribution:** India, Iran.

#### Acknowledgements

The authors are grateful to Dr. Kailash Chandra, Director, Zoological Survey of India for his encouragement and moral support and providing necessary facilities. We thank Laurence A.

Mound (CSIRO, Australia) for reviewing this manuscript. Dr. Kambiz Minaei (Shiraz University, Shiraz) is thanked for his comments on type specimens of *P. erami*. The study is financially supported by core funding to the corresponding author through ZSI research programme “Investigating thrips diversity (Thysanoptera: Insecta) in Rajasthan State of India”. This work is a part of the Ph. D thesis of the first author.

#### References

- Crespi, B. and Abbot, P. 1999. The behavioral ecology and evolution of kleptoparasitism in Australian gall thrips. *Florida Entomologist* 82(2): 147-164.
- Minaei, K. 2015. *Podothrips*: first record from Iran with a new species (Thysanoptera: Phlaeothripidae). *Turkish Journal of Zoology* 39: 958-961. doi: 10.3906/zoo-1409-38.
- Palmer, J.M. and Mound, L.A. 1991. Thysanoptera. Chapter 22. In: Rosen D, (ed.) *The Armoured Scale Insects: Their Biology, Natural Enemies and Control*. Vol. B. Amsterdam, Netherlands: Elsevier, pp. 67-76.
- Ritchie, J.M. 1974. A revision of the grass-living genus *Podothrips* (Thysanoptera: Phlaeothripidae). *Journal of Entomology Series B*: 261-282.
- ThripsWiki 2016. *ThripsWiki*—providing information on the World's thrips. Available from: [http://thrips.info/wiki/Main\\_Page](http://thrips.info/wiki/Main_Page) (accessed 7 September 2016).
- Tyagi, K. and Kumar, V. 2016a. Thrips (Insecta: Thysanoptera) of India- An Updated Checklist. *Halteres* 7: 64-98.
- Tyagi, K. and Kumar, V. 2016b. The Sericothripinae genus *Neohydatothrips* (Thysanoptera, Thripidae) in India with description of two new species. *Zootaxa* 4132(3): 438-444.



# First Inventory of Ants (Hymenoptera: Formicidae) in Northwestern Shivalik, India

Himender Bharti<sup>1</sup>, \*Aijaz Ahmad Wachkoo<sup>2</sup> and Rakesh Kumar<sup>3</sup>

<sup>1</sup>Department of Zoology and Environmental Sciences, Punjabi University, Patiala – 147002, India.

<sup>2</sup>Department of Zoology, Govt. Degree College, Shopian – 192303, India.

<sup>3</sup>Department of Agriculture, Baba Farid College, Bathinda – 151001, India.

(Email: [aijaz\\_shoorida@yahoo.co.in](mailto:aijaz_shoorida@yahoo.co.in))

## Abstract

The first inventory of the ants of Indian Northwestern Shivalik is presented. A total of 179 names of species group taxa (163 species, 16 subspecies) are recorded based on literature records and newly sampled material from 2008-2012. Twenty nine species are endemics whilst ten species are introduced. Synonyms, new localities, notes about type localities, depositories and statewise distribution in Northwestern Shivalik is also included. The study indicates that most of the areas of the vast Indian territory are unexplored for ants, perhaps majority of the ants in India are still awaiting identification and future collections should provide many new species records.

**Keywords:** *Ants, species inventory, distribution, Shivalik, India.*

Received: 15 January 2017; Revised: 22 May 2017; Online: 24 May 2017.

## Introduction

The Shivalik hills (29° 57' to 31° 20' N and 77° 35' to 79° 20' E) are the southernmost and geologically youngest eastwest mountain chain of the Himalaya. The Shivaliks have many sub-ranges, extending from Sikkim westward through Nepal and Uttarakhand, continuing into Jammu and Kashmir and Pakistan (Fig. 1). Shivalik range is of more recent formation, and is, perhaps, the most recently formed range of similar magnitude on earth (Burrard and Hayden, 1980). Natural vegetation of the Shivalik comprises of the Northwestern tropical dry deciduous forests with the abundance of thorny species; Himalayan subtropical pine forests; tropical and subtropical broadleaf forests. The climate of Shivaliks is subtropical to sub-humid and humid with warm summer and cold winter. Mean annual rainfall varies from 800 to 1400 mm, bulk of which (about 80%) is received during monsoon. Soils are loamy, sandy and skeletal. Shivalik is of significance because of its propinquity to populated tracts. The natural resources in this region are in a process of severe degradation due to increased

anthropogenic activities. The continued over-exploitation and mismanagement of soil resources through deforestation, overgrazing and clearance of lands for agricultural purposes disregard to slope and topography, have resulted in ecological degradation in Shivalik hills (Sidhu *et al.*, 2000).

Accurate faunal lists are the foundation for biodiversity research and essential for understanding distribution of species, and ecosystem structure. These studies are critical for the development of conservation plans. In order to assess how environmental threats affect native biodiversity, it is important to establish baseline inventories before local populations and endemic species are driven extinct (Sarnat *et al.*, 2013; Shah *et al.*, 2014; Wachkoo *et al.*, 2017).

Several ant sampling projects have been undertaken in the India during the last decade however, the faunal knowledge for most of the Indian geographic regions remains fragmentary and insufficient (Bharti *et al.*, 2016a). The ant fauna of Shivalik hills has been least known of all Indian regions (Kumar, 2013; Wachkoo,



2013). Considering, the undersampling of ant biodiversity in Shivalik hills, we present herewith, the first results from an intensive ant inventory carried out in northwestern states of Indian Shivalik: Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand (Fig. 1). The inventory is based mostly on specimens collected in northwestern Shivalik from 2008 to 2012, and earlier literature records.

The present study based on actual material collected during the recent surveys aims to create an inventory of ants in Indian Northwestern Shivalik with synonyms, type localities, new localities and type depositories. A special emphasis on primary types excludes inaccuracies caused by incorrect identification, and the list provides a baseline for an assessment of the biodiversity of the family Formicidae in India.

The intent of this paper is to provide baseline data useful to all those concerned, who care for the reforestation, rehabilitation and restoration of Shivaliks for the posterity.

## Materials and Methods

The present inventory was generated using material collected between 2008 and 2012 in Indian Northwestern Shivalik, covering primary, secondary and non-forest sites (Fig. 2). In Northwestern Shivalik, primary forests are restricted to Terrace (Himachal Pradesh), part of Forest Research Institute, Rajaji Forest Area and Selaqui (Uttarakhand). These contain tropical and subtropical broadleaf forests characterized by *Anogeissus latifolia*, *Bauhinia retusa*, *Bauhinia variegata*, *Mallotus philippinensis*, *Shorea robusta*, *Terminalia* spp. etc., predominantly dense green jungles, forming a habitat for a large flora and fauna. Most of the forest cover in Northwestern Shivalik is of secondary type, due to regular forest fires and deforestation. In present study Andretta, Bajaura, Bakhra, Dattal, Ghatti, Guraldhar, Kandwal, Khajjiyan, Kotla, Lwasa, Mandi, Nagabari, Nahan, Palampur, Renuka, Rewalsar (Himachal Pradesh); Billawar, Jasrota, Manda, Mansar, Samba, Sukrala, Surinsar (Jammu and Kashmir); Chohal, Dharampur, Ropar (Punjab); Dakpathar and Mussoorie (Uttarakhand) areas constituting the secondary forest types of Northwestern Shivalik were surveyed for ants.

Secondary forests of Northwestern Shivalik constitute the Northern tropical dry deciduous forests with abundance of thorny species e.g., *Acacia* spp., and Himalayan subtropical pine forests e.g., *Pinus roxburghii*. Due to rapidly increasing human population most of the Northwestern Shivalik is extirpated of its natural vegetation and converted to agricultural lands, human settlements, industrial areas and other urban constructions. Non-forested sites including agricultural fields, dam sites, play fields, community gardens, parks, college and university campuses falling in Baijnath, Bari, Bilaspur, Chanaur, Dehra, Dhaliara, Gagret, Ghamrur, Guga, Jassur, Jogi Panga, Jol, Khatiar, Kushinagar, Poanta Sahib, Pong Dam, Siholi, Suketi, Una (Himachal Pradesh); Kathua, Udhampur (Jammu and Kashmir); Dunera, Sukhna, Thein Dam (Punjab); Assan Barrage and Ranger's College (Uttarakhand) were also surveyed. Site selection was aimed specifically to have an overall look on ant composition of the study region.

The field survey was carried regularly from 2008 to 2012, covering each site to get the proper picture of ant composition in the region. A broad range of sampling techniques was applied at all sites. Ant nests and individual specimens were collected on the ground, in leaf litter, under stones, in dead wood, on tree trunks and twigs using Winkler's leaf litter extractor, pitfall traps, soil core, beating vegetation, honey baits and hand collecting (Fig. 3). All specimens were preserved in 75% ethanol. The sampled material is deposited in the ant collection of the Punjabi University, Patiala (PUAC). The localities which were surveyed for the first time are marked with "\*" however, we also include literature records for the taxa already known in Northwestern Shivalik e.g., Himachal Pradesh (Chintpurni, Dharamsala, Nahan, Nangal, Solan, Talwara, Terrace); Punjab (Chandigarh, Chohal, Dunera, Pathankot, Ropar) and Uttarakhand (Dehradun, Rajaji National Park). All sampled localities are mentioned in Table 1.

Most of the names of the described species presented are in accordance with the most recent Formicidae classification following AntWeb. The inventory is arranged systematically to subfamily level and alphabetically thereafter, so as to make the



search easier for a given taxon. Main references to the distributions of given taxa in Northwestern Shivalik are listed. The acronyms and their equivalents used for depositories are: ANIC - Australian National Insect Collection, Canberra, Australia; BMNH - The Natural History Museum (British Museum, Natural History), London, U.K.; CASC - California Academy of Sciences Collection, San Francisco, California, U.S.A.; HNHM - Hungarian Natural History Museum, Budapest, Hungary; MCZC - Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A.; MHNG - Muséum d'Histoire Naturelle, Geneva, Switzerland; MNHN - Muséum d'Histoire Naturelle de la Ville de Genève, Geneva, Switzerland; MSNG - Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy; MZLS - Museo Zoologico La Specola, Florence, Italy; NHMB - Naturhistorisches Museum, Basel, Switzerland; NHMW - Natural History Museum Vienna, Austria; OUMNH - University Museum of Natural History, Oxford, U.K.; PUAC - Punjabi University Patiala Ant Collection, Punjab, India; ZISP - Zoological Institute, Academy of

Sciences, St. Petersburg, Russia; ZMUC - Zoological Museum, University of Copenhagen, Copenhagen, Denmark; ZMUK - Zoologisches Museum, Universität Kiel, Germany; ZSIK - Zoological Survey of India, Kolkata, India.

## Species inventory

### Subfamily Amblyoponinae

#### *Prionopelta kraepelini* Forel, 1905

**Type locality:** Indonesia: Java: Tjompea, near Bogor

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Andretta, 1 (w.), 11.vi.2010; Dattal, 4 (w.), 16.vi.2010; Nagabari, 2 (w.), 1 (m.), 18.vi.2009. **Jammu and Kashmir:** Jasrota, 2 (w.), 28.vii.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (Bharti and Wachkoo, 2012a: 816).

#### *Stigmatomma boltoni* (Bharti and Wachkoo, 2011)

*Amblyopone boltoni* Bharti and Wachkoo, 2011

**Type locality:** India: Himachal Pradesh: Ghatti, Khatiar, Terrace

**Type depository:** HT, PT: PUAC; PT: CASC

**Material examined:** **Himachal Pradesh:** Terrace, 1 (w.), 17.vii.2010; Ghatti, 2 (w.), 11.x.2008; Khatiar, 6 (w.), 18.x.2010, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Wachkoo, 2011: 586).

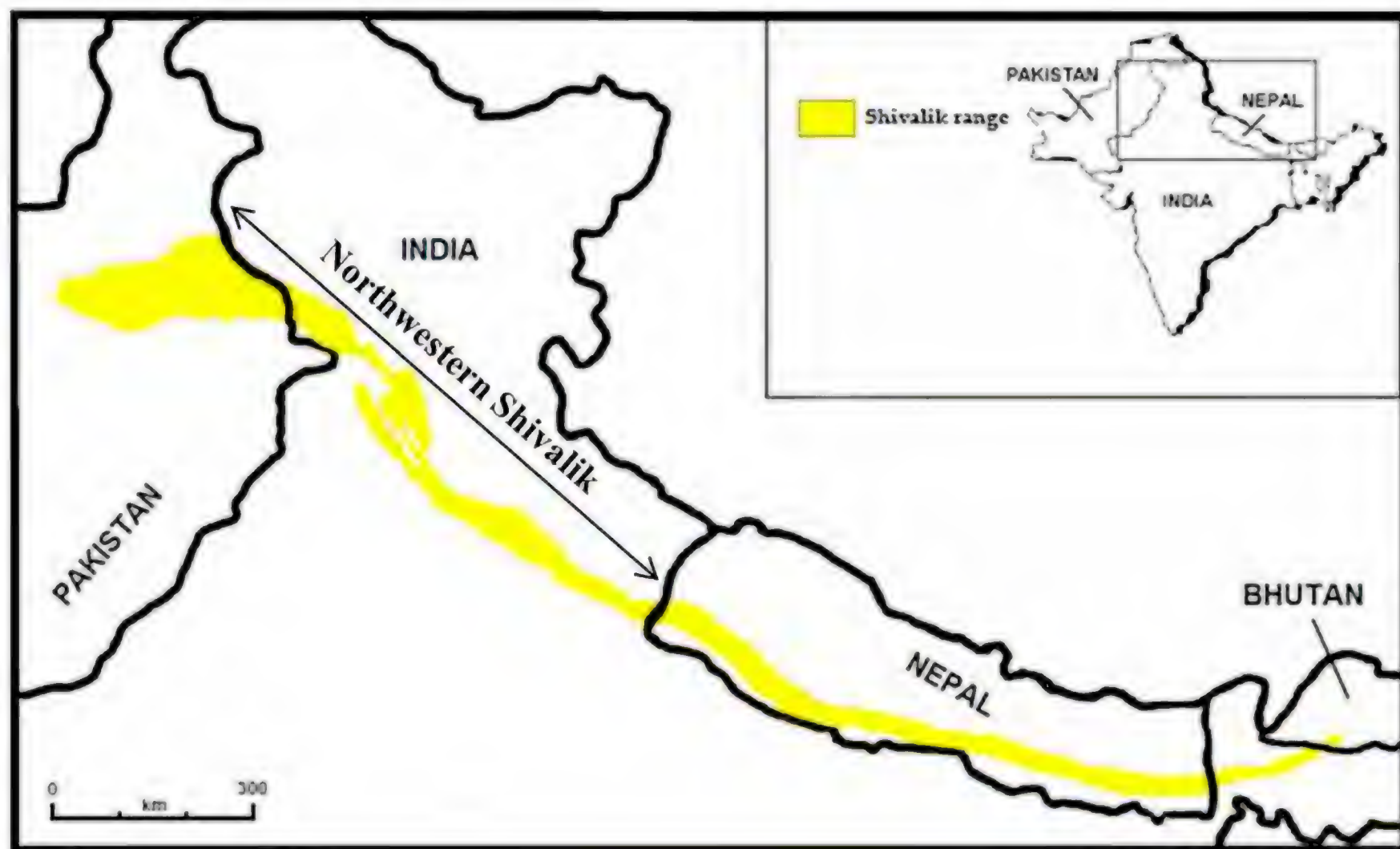
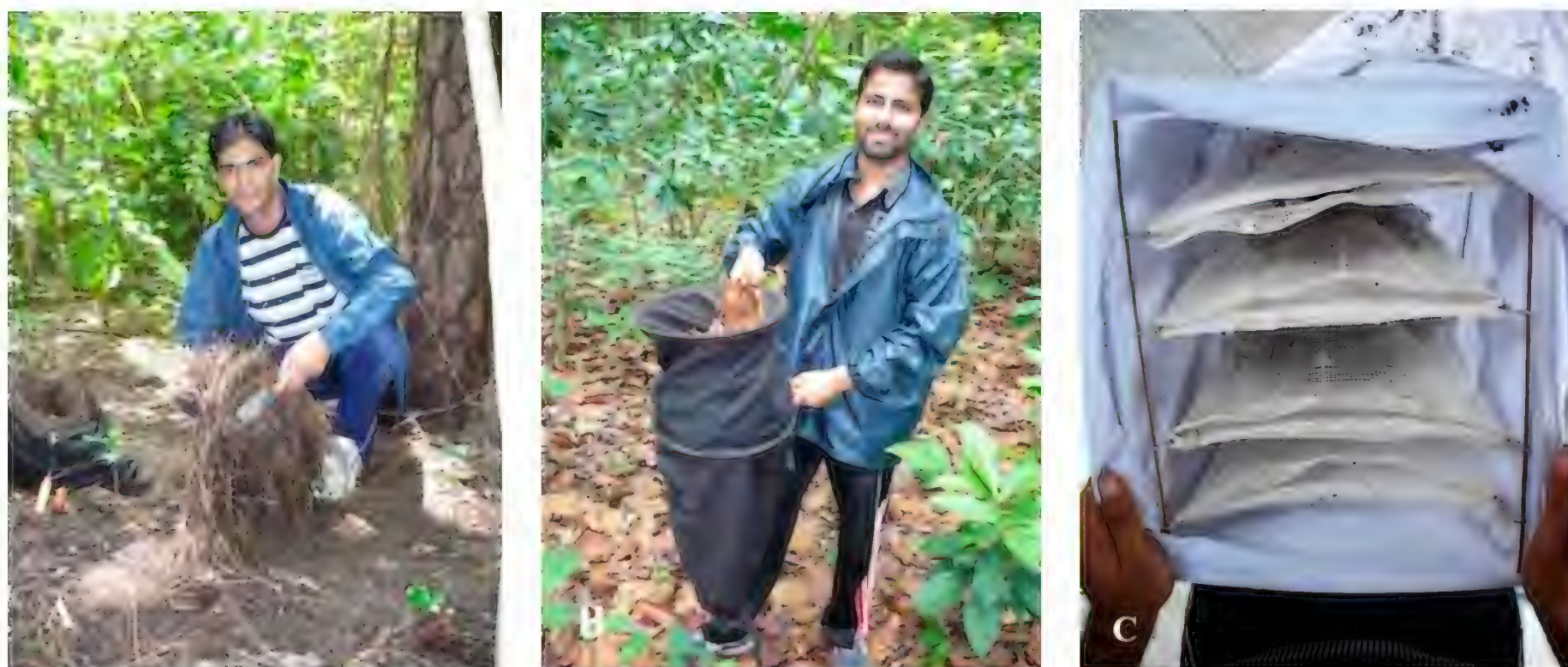


Fig. 1. Map showing location of the Shivalik range.

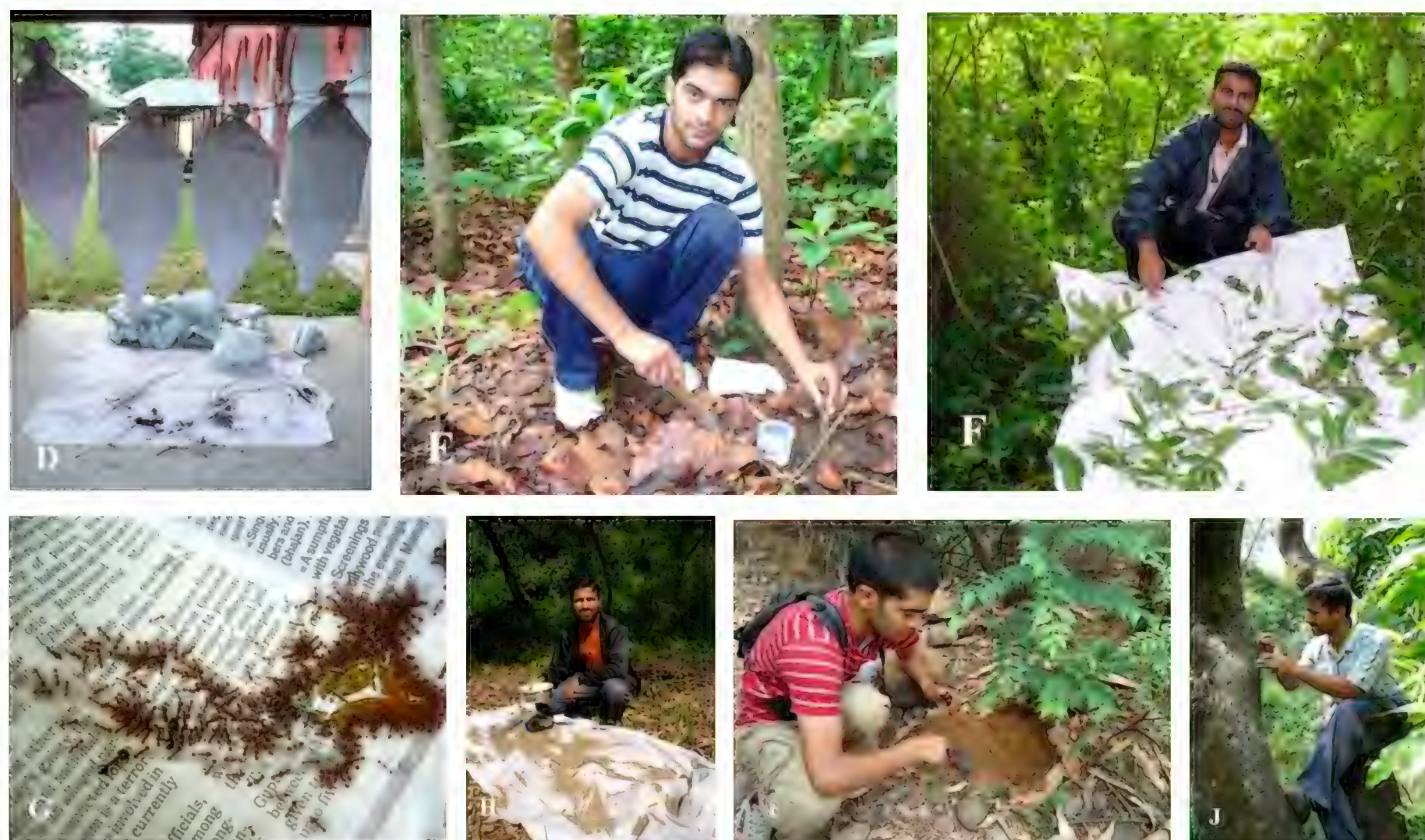




**Fig. 2. Forests in Northwestern Shivalik: A and B: Primary Forests; C and D: Secondary Forests**







**Fig. 3. Collection techniques used to sample ants: A, Leaf litter collection; B, Leaf litter sifting; C, Winkler bag with four mini Winkler sacs; D, Winkler bags hanging up at a collection locality; E, Placing a pitfall trap; F, Collecting dislodged ants on a beating sheet; G, Ants baited with honey; H, Sieving soil sample for ants; I, Excavating an ant nest; J, Searching for arboreal ants.**

### Subfamily Dolichoderinae

#### *Chronoxenus wroughtonii* (Forel, 1895)

*Bothriomyrmex wroughtonii* Forel, 1895

**Type locality:** India: Karnataka: Kanara; Uttarakhand: Dehradun

**Type depository:** LT: NHMB; PLT: BMNH, MHNG, MZLS

**Material examined:** **Himachal Pradesh:** Andretta, 4 (w.), 11.vi.2010; Baijnath, 1 (w.), 17.vi.2010; Bari, 12 (w.), 15.x.2008; Dattal, 6 (w.), 16.vi.2010; Dehra, 8 (w.), 06.vii.2010; Guraldhar, 31 (w.), 16.x.2008; Khajjiyan, 29 (w.), 19.vi.2009; Khatiar, 3 (w.), 11.x.2009; Khushinagar, 3 (w.), 17.vi.2009; Kotla, 6 (w.), 14.vii.2010; Nagabari, 12 (w.), 18.vi.2009; Nahan, 15 (w.), 23.viii.2009; Siholi, 36 (w.), 14.x.2009; Suketi, 1 (w.), 25.viii.2009; Terrace, 8 (w.), 23.x.2008, 5(w.), 25.v.2009, 8 (w.), 25.ix.2009. **Jammu and Kashmir:** Kathua, 47 (w.), 25.vii.2010; Sukrala, 5 (w.), 07.viii.2010. **Punjab:** Dunera, 30 (w.), 21.vi.2009. **Uttarakhand:** Assan Barrage, 36 (w.), 21.viii.2009, 20 (w.), 10.v.2009; Dakpathar, 10 (w.), 20.viii.2009; Forest Research Institute, 12 (w.), 30.vii.2009, 4 (w.), 13.v.2009, leg R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (new record); Punjab (Bharti *et al.*, 2009: 40); Uttarakhand (Forel, 1895: 470; Shattuck, 1994: 37).

#### *Dolichoderus taprobanae* (Smith, F., 1858)

*Formica taprobanae* Smith, F., 1858

*Formica ingruens* Walker, 1859

*Hypoclinea gracilis* Motschoulsky, 1863

*Dolichoderus semirufus* André, 1887

*Dolichoderus taprobanae* var. *obscuripes* Santschi, 1920

*Dolichoderus taprobanae* var. *tonkina* Santschi, 1920

**Type locality:** Sri Lanka

**Type depository:** HT: BMNH

**Material examined:** **Himachal Pradesh:** Andretta, 6 (w.), 1 (q.), 12.vi.2010, 28 (w.), 13.vi.2010, 35 (w.), 20.vi.2010; Baijnath, 7 (w.), 17.vi.2010. **Uttarakhand:** Rajaji Forest Area, 7 (w.), 05.viii.2009, 204 (w.), 10.viii.2009, 12(w.), 11.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record); Jammu and Kashmir (Bharti *et al.*, 2013a: 84).

#### *Ochetellus glaber* (Mayr, 1862)

*Hypoclinea glabra* Mayr, 1862

*Iridomyrmex itoi* Forel, 1900

**Type locality:** Australia: New South Wales: Sydney

**Type depository:** ST: NHMW

**Material Examined:** **Himachal Pradesh:** Andretta, 1 (w.), 15.vi.2010; Bajaura, 6 (w.), 23.vi.2010; Kotla, 2 (w.), 28.v.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti, 2002a: 341).

#### *Tapinoma himalaicum* Bharti, Kumar and Dubovikoff, 2013

*Tapinoma himalaica* Bharti, Kumar and Dubovikoff, 2013

**Type locality:** India: Himachal Pradesh: Kotla, Siholi, Terrace; Jammu and Kashmir: Manda; Punjab: Dharampur

**Type depository:** HT, PT: PUAC; PT: BMNH; PT: ZISP

**Material Examined:** **Himachal Pradesh:** Kotla, 3 (w.), 13.x.2008; Siholi, 2 (w.), 2.x.2009; Terrace, 13 (w.), 25.ix.2009.

**Jammu and Kashmir:** Manda, 3 (w.), 4.viii.2010. **Punjab:** Dharampur, 2 (w.), leg. R. Kumar (type series).



**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Punjab (Bharti *et al.*, 2013b: 303).

***Tapinoma melanocephalum* (Fabricius, 1793)**

*Formica melanocephala* Fabricius, 1793

*Formica nana* Jerdon, 1851

*Myrmica pellucida* Smith, F. 1857

*Formica familiaris* Smith, F. 1860

*Tapinoma melanocephalum* var. *australe* Santschi, 1928

*Tapinoma melanocephalum* var. *australis* Santschi, 1928

**Type locality:** French Guiana

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Bakhra, 72 (w.), 07.x.2008; Chanaur, 10 (w.), 12.vi.2009; Ghatti, 106 (w.), 12.x.2008, 22 (w.), 28.ix.2009, 20 (w.), 13.x.2009; Guga, 80 (w.), 06.x.2008; Guraldhar, 6 (w.), 16.x.2008, 24 (w.), 04.x.2009; Jogi Panga, 12 (w.), 09.x.2008; Kandwal, 5 (w.), 25.vi.2009, 5 (w.), 2 (q.), 23.vii.2010; Khatiar, 20 (w.), 13.x.2008, 31 (w.), 18.x.2008; Kotla, 3 (w.), 28.v.2009; Paonta Sahib, 30 (w.), 09.v.2009, 41 (w.), 19.viii.2009; Rehan, 12 (w.), 08.vii.2010; Renuka, 8 (w.), 08.v.2009; Rewalsar, 36 (w.), 2 (q.), 30.vi.2010; Siholi, 40 (w.), 19.x.2008; Terrace, 93 (w.), 1 (q.), 11.x.2008, 2 (w.), 21.x.2008, 20 (w.), 22.v.2009, 10 (w.), 25.ix.2009; Una, 25 (w.), 05.x.2008. **Jammu and Kashmir:** Kathua, 22 (w.), 25.vii.2010, 36 (w.), 30.vii.2010; Samba, 10 (w.), 11.vii.2009; Surinsar, 4 (w.), 14.vii.2009. **Punjab:** Chohal, 50 (w.), 08.x.2008; Dharampur, 2 (w.), 14.x.2008; Thein Dam, 7 (w.), 26.vi.2009. **Uttarakhand:** Assan Barrage, 15 (w.), 21.viii.2009; Forest Research Institute, 12 (w.), 1.viii.2009, 2 (w.), 17.viii.2009; Rajaji Forest Area, 12 (w.), 3 (q.), 13.viii.2009; Selaqui, 13 (w.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 84), Punjab (Tak and Kazmi, 2011: 41; Bharti *et al.*, 2009: 39).

***Technomyrmex albipes* (Smith, F., 1861)**

*Crematogaster forticulus* Walker, 1859

*Formica detorquens* Walker, 1859

*Formica albipes* Smith, F., 1861

*Tapinoma nigrum* Mayr, 1862

*Tapinoma albitarse* Motschoulsky, 1863

*Technomyrmex albipes* var. *bruneipes* Forel, 1895

*Technomyrmex albipes* r. *wedda* Forel, 1913

**Type locality:** Indonesia: Sulawesi Utara: Tondano

**Type depository:** ST: OUMNH

**Material Examined: Himachal Pradesh:** Andretta, 11 (w.), 12.vi.2010, 4 (w.), 20.vi.2010; Bilaspur, 25 (w.), 01.vii.2010; Nahan, 5 (w.), 06.v.2009; Paonta Sahib, 31 (w.), 09.v.2009; Renuka, 3 (w.), 26.viii.2009. **Uttarakhand:** Forest Research Institute, 1(w.), 01.x.2008, 6 (w.), 30.vii.2009, 1 (w.), 03.viii.2009, 5 (w.), 1 (q.), 12.viii.2009, 3 (w.), 17.viii.2009, 4 (w.), 19.v.2010; Rajaji Forest Area, 8 (w.), 5 (q.), 05.viii.2009, 2 (w.), 06.ix.2010; Selaqui, 3 (w.), 02.x.2008, 2 (w.), 03.x.2008, 2 (w.), 07.viii.2009, 1 (w.), 08.viii.2009, 4 (w.), 1 (q.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2013a: 84); Uttarakhand (Imai *et al.*, 1984: 8).

***Technomyrmex elatior* Forel, 1902**

*Technomyrmex albipes* var. *cordiformis* Viehmeyer, 1916

**Type locality:** India: Assam

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 19 (w.), 1 (major intercaste), 12.vi.2010, 1 (w.), 13.vi.2010; Baijnath, 1 (w.), 17.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

***Technomyrmex rector* Bolton, 2007**

**Type locality:** India: Tamil Nadu: Coimbatore

**Type depository:** HT: BMNH

**Material Examined: Himachal Pradesh:** Kotla, 10 (w.), 28.v.2009; Lwasa, 9 (w.), 07.v.2009; Siholi, 16 (w.), 02.x.2009, 4 (w.), 14.x.2009; Terrace, 14 (w.), 11.x.2008, 5 (w.), 25.v.2009, 1 (w.), 24.ix.2009, 12 (w.), 09.vii.2010, 3 (w.), 24.ix.2009. **Jammu and Kashmir:** Mansar, 9 (w.), 31.vii.2010. **Uttarakhand:** Selaqui, 10 (w.), 07.viii.2009, 10 (w.), 09.viii.2009, leg. R. Kumar. **Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (new record).

**Subfamily Dorylinae**

***Aenictus aitkenii* Forel, 1901**

*Aenictus aratus* var. *asiatica* Forel, 1911

**Type locality:** India: Karnataka: Kanara; Kerala: Travancore; Maharashtra: Thane

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Nahan, 34 (w.), 23.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wilson, 1964: 447), Jammu and Kashmir (Bharti *et al.*, 2013a: 84).

***Aenictus brevicornis* (Mayr, 1879)**

*Typhlatta brevicornis* Smith, F., 1873

*Typhlatta brevicornis* Mayr, 1879

**Type locality:** India: West Bengal: Kolkata, Eden Gardens

**Type depository:** LT; PLT: NHMW

**Material examined: Punjab:** Sukhna, 33 (w.), 23.x.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Punjab (Imai *et al.*, 1884b: 8; Tak and Kazmi, 2011: 41).

***Aenictus ceylonicus* (Mayr, 1866)**

*Typhlatta ceylonica* Mayr, 1866

*Aenictus ceylonicus* var. *latro* Forel, 1901

*Aenictus ceylonicus* var. *formosensis* Forel, 1913

**Type locality:** Sri Lanka

**Type depository:** ST: NHMW

**Material examined: Himachal Pradesh:** Andretta, 82 (w.), 12.6.2010; Ghatti, 56 (w.), 26.ix.2009; Nahan, 69 (w.), 23.viii.2009. **Jammu and Kashmir:** Mansar, 180 (w.), 2.viii.2010. **Uttarakhand:** Dakpathar, 56 (w.), 20.viii.2009; Rajaji Forest Area, 27 (w.), 12.viii.2009, 26 (w.), 13.viii.2009; Selaqui, 55 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wilson, 1964: 454).

***Aenictus doryloides* Wilson, 1964**

**Type locality:** India: Himachal Pradesh: Solan

**Type depository:** HT, PT: MCZC

**Material examined: Himachal Pradesh:** Andretta, 17 (w.), 15.vi.2010. **Uttarakhand:** Rajaji Forest Area, 84 (w.), 5.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wilson, 1964: 460; Jaitrong and Yamane, 2013: 227), Jammu and Kashmir (Bharti *et al.*, 2013a: 84), Uttarakhand (new record).

***Aenictus pachycerus* (Smith, 1858)**

*Eciton pachycerus* Smith, F., 1858

*Typhlatta bengalensis* Mayr, 1879

*Aenictus bengalensis* var. *continuus* Forel, 1901

**Type locality:** India

**Type depository:** ST: BMNH

**Material examined: Himachal Pradesh:** Poanta Sahib, 84 (w.), 19.viii.2009, 10 (w.), Jassur, 8.vi.2009. **Uttarakhand:** Ranger's



## Ants in Northwestern Shivalik

College, 108 (w.), 8.vi.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wilson, 1964: 471; Tiwari, 1999: 17), Jammu and Kashmir (Bharti *et al.*, 2013a: 84), Punjab (Bharti *et al.*, 2009: 39), Uttarakhand (Forel, 1901: 476, 1906: 90; Wilson, 1964: 471; Tiwari, 1999: 17; Bharti, 2003: 717).

### *Aenictus peguensis* Emery, 1895

**Type locality:** Myanmar: Palon: Pegù

**Type depository:** LT, PLT: MSNG

**Material examined: Himachal Pradesh:** Andretta, 12 (w.), 15.vi.2010; Ghatti, 8 (w.), 26.ix.2009; Kotla, 36 (w.), 28.v.2009, 10 (w.), 30.v.2010; Nahan, 30 (w.), 27.ix.2009. **Uttarakhand:** Assan Barrage, 5 (w.), 2.viii.2009, 58 (w.), 21.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### *Aenictus sagei* Forel, 1901

*Aenictus wroughtonii* var. *sagei* Forel, 1901

**Type locality:** India: Himachal Pradesh: Dharamsala

**Type depository:** LT, PLT: MHNG

**Material examined: Himachal Pradesh:** Andretta, 16 (w.), 11.vi.2010, 5 (w.), 12.6.2010, 6 (w.), 13.vi.2010; Poanta Sahib, 110 (w.), 19.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1901: 469, 1906: 90; Wilson, 1964: 477; Pisarski, 1967: 377; Jaitrong *et al.*, 2010: 40); Punjab (Emery, 1910: 30; Chapman and Capco, 1951: 12).

### *Aenictus wilsoni* Bharti, Wachkoo and Kumar, 2012

**Type locality:** India: Himachal Pradesh: Andretta

**Type depository:** HT, PT: PUAC; PT: BMNH, MCZC

**Material examined: Himachal Pradesh:** Andretta, 108 (w.), 12.vi.2010, 21 (w.), 20.vi.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti *et al.*, 2012: 292).

### *Chrysapace costatus* (Bharti and Wachkoo, 2013)

*Cerapachys costatus* Bharti and Wachkoo, 2013a

**Type locality:** India: Uttarakhand: Forest Research Institute

**Type depository:** HT: PUAC

**Material examined: Uttarakhand:** Forest Research Institute, 1 (w.), 4.ix.2010, leg. Aijaz A. Wachkoo (holotype).

**Distribution in Northwestern Shivalik:** Uttarakhand (Bharti and Wachkoo, 2013a: 1191).

### *Dorylus labiatus* Shuckard, 1840

*Dorylus hindostanus* Smith, F., 1859

*Dorylus laeviceps* Smith, F., 1878

**Type locality:** India: Assam; Maharashtra: Pune

**Type depository:** T: OUMNH

**Material examined: Himachal Pradesh:** Rewalsar, 29 (w.), 29.vi.2010. **Uttarakhand:** Assan Barrage, 19 (w.), 10.v.2009, 28 (w.), 21.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1901: 464, 1906: 90; Bharti, 2001: 163; Wilson, 1964: 440), Jammu and Kashmir (Bharti *et al.*, 2013a: 84), Punjab (Bharti, 2001: 163; Tak and Rathore, 2004: 165; Bharti *et al.*, 2009: 39; Tak, 2009: 8, 2010: 135; Tak and Kazmi, 2011: 40), Uttarakhand (Forel, 1901: 464, 1906: 90; Wilson, 1964: 440).

### *Dorylus orientalis* Westwood, 1835

*Labidus curtisii* Shuckard, 1840

*Dorylus longicornis* Shuckard, 1840

*Alaopone oberthueri* Emery, 1881

*Dorylus fuscus* Emery, 1889

**Type locality:** India

**Type depository:** T: OUMNH

**Material examined: Himachal Pradesh:** Andretta, 14 (w.), 20.vi.2010; Ghatti, 30 (w.), 4 (m.), 28.ix.2009, 22 (w.), 3 (m.), 13.x.2009; Guraldhar, 130 (w.), 5 (m.), 6.x.2008; Mandi, 24 (w.), 27.vi.2010; Nagabari, 51 (w.), 1 (m.), 18.vi.2009; Nahan, 7 (w.), 23.viii.2009; Poanta Sahib, 19 (w.), 8 (m.), 19.viii.2009; Siholi, 9 (w.), 12.x.2009; Terrace, 5 (w.), 2 (m.), 17.vii.2009, 6 (w.), 20 (m.), 19.vii.2009. **Jammu and Kashmir:** Kathua, 1 (w.), 23.vii.2010; Surinsar, 9 (w.), 14.vii.2009. **Punjab:** Sukhna, 150 (w.), 5.iv.2011, 4 (w.), 25.v.2011. **Uttarakhand:** Forest Research Institute, 1 (w.), 30.ix.2008; Rajaji Forest Area, 5 (w.), 6.viii.2009, 30 (w.), 11.viii.2009, 4 (w.), 6.ix.2010; Selaqui, 55 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir (Bharti *et al.*, 2013a: 84), Punjab (Tak and Rathore, 2004: 165; Bharti *et al.*, 2009: 39; Tak, 2009: 9; Tak and Kazmi, 2011: 40), Uttarakhand (Forel, 1901: 464, 1906: 90; Wilson, 1964: 442; Roonwal, 1976: 309).

### *Lioponera longitarsus* Mayr, 1879

*Lioponera longitarsus* var. *australis* Forel, 1895

*Lioponera longitarsus* r. *parva* Forel, 1900

*Lioponera bicolor* Wheeler and Chapman, 1925

*Phyracaces pygmaeus* Clark, 1934

*Lioponera alfieri* Donisthorpe, 1939

*Cerapachys aegyptiacus* Brown, 1975

**Type locality:** India: West Bengal: Kolkata

**Type depository:** ST: NHMW

**Material examined: Jammu and Kashmir:** Surinsar, 1 (w.), 14.vii.2009. **Punjab:** Sukhna, 1 (q.), 4.x.2010. **Uttarakhand:** Rajaji Forest Area, 1 (w.), 11.viii.2009; Selaqui, 1 (w.), 7.viii.2009, 9 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2013a: 84), Punjab (Bharti *et al.*, 2009: 39), Uttarakhand (Forel, 1900a: 330, 1906: 91; Donisthorpe, 1939: 254).

### *Ooceraea biro* (Forel, 1907)

*Cerapachys biro* Forel, 1907

*Cerapachys silvestrii* Wheeler, 1909

*Cerapachys sinensis* Wheeler, 1928

*Cerapachys seini* Mann, 1931

*Cerapachys ierensis* Weber, 1939

**Type locality:** Singapore

**Type depository:** LT, PLT: MHNG

**Material examined: Himachal Pradesh:** Suketi, 5 (w.), 25.viii.2009. **Jammu and Kashmir:** Manda, 110 (w.), 15.vii.2009, 19 (w.), 4.viii.2010. **Uttarakhand:** Forest Research Institute, 8 (w.), 30.ix.2008; Rajaji Forest Area, 8 (w.), 11.viii.2009, 19 (w.), 12.viii.2009, 6 (w.), 13.viii.2009, 22 (w.), 6.ix.2010; Selaqui, 203 (w.), 8.viii.2009, 160 (w.), 5.ix.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 84).

### *Parasyscia browni* (Bharti and Wachkoo, 2013)

*Cerapachys browni* Bharti and Wachkoo, 2013a

**Type locality:** India: Uttarakhand: Rajaji Forest Area

**Type depository:** HT: PUAC

**Material examined: Uttarakhand:** Rajaji Forest Area, 1 (w.), 12.viii.2009, leg. Aijaz A. Wachkoo (holotype).

**Distribution in Northwestern Shivalik:** Uttarakhand (Bharti and Wachkoo, 2013a: 1189).

## Subfamily Formicinae



***Acropyga acutiventris* Roger, 1862**

*Plagiolepis flava* Mayr, 1862

*Acropyga moluccana* Mayr, 1879

*Acropyga crassicornis* Emery, 1900

*Acropyga moluccana* var. *australis* Forel, 1902

*Acropyga moluccana* subsp. *mysolensis* Forel, 1911

*Acropyga moluccana* var. *opaca* Stitz, 1911

*Acropyga moluccana* var. *occipitalis* Stitz, 1912

*Acropyga moluccana* subsp. *papuana* Mann, 1919

*Acropyga acutiventris* var. *carinata* Karavaiev, 1933

*Acropyga acutiventris* var. *javana* Karavaiev, 1933

*Acropyga indosinensis* Wheeler, 1935

*Pseudolasius undecema* Donisthorpe, 1949

**Type locality:** Sri Lanka

**Type depository:** ST: Unknown

**Material examined: Uttarakhand:** Forest Research Institute, 640m, 7 (w.), 4.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

***Camponotus compressus* (Fabricius, 1787)**

*Formica compressa* Fabricius, 1787

*Formica indefessa* Sykes, 1835

*Formica callida* Smith, F., 1858

*Camponotus quadrilaterus* Roger, 1863

**Type locality:** India: Tamil Nadu: Tharangambadi

**Type depository:** ST: Unknown

**Material examined: Himachal Pradesh:** Andretta, 15 (w.), 11.vi.2010, 43 (w.), 12.vi.2010, 17 (w.), 3 (q.), 10 (m.), 13.vi.2010; Bakhra, 2 (w.), 7.x.2008; Bari, 7 (w.), 15.x.2008, 6 (w.), 6.vi.2009, 17 (w.), 1.x.2009, 2 (w.), 1 (q.), 12.vii.2010; Chanaur, 9 (w.), 20.x.2008, 25 (w.), 5.vi.2009, 2 (w.), 12.vi.2009, 2 (w.), 3.x.2009; Dehra, 1 (w.), 6.vii.2010; Gagret, 26 (w.), 8.x.2008, 2 (w.), 17.x.2009; Ghamrur, 1 (w.), 1.vi.2009; Ghatti, 2 (w.), 11.x.2008, 2 (w.), 10.vii.2010; Guga, 40 (w.), 6.x.2008; Guraldhar, 1 (w.), 4.x.2009; Jogi Panga, 2 (w.), 9.x.2008; Jol, 425m, 4 (w.), 6.x.2009; Kandwal, 2 (w.), 25.vi.2009; Khatiar, 2 (w.), 18.x.2008, 1 (w.), 11.x.2009; Kotla, 2 (w.), 13.x.2008, 23 (w.), 22.x.2008, 17 (w.), 30.v.2009, 2 (w.), 30.ix.2009, 14 (w.), 13.vii.2010; Kushinagar, 13 (w.), 17.vi.2009; Nagabari, 10 (w.), 18.vi.2009; Poanta Sahib, 4 (w.), 9.v.2009, 1 (w.), 19.viii.2009; Pong Dam, 1 (q.), 17.x.2008; Renuka, 13 (w.), 8.v.2009, 8 (q.), 26.viii.2009; Siholi, 44 (w.), 19.x.2008, 14 (w.), 4.vi.2009, 2 (w.), 2.x.2009, 3 (w.), 14.x.2009, 1 (w.), 8.vii.2010; Suketi, 14 (w.), 25.viii.2009; Terrace, 6 (w.), 24.v.2009, 6 (w.), 25.v.2009, 3 (w.), 23.ix.2009, 1 (w.), 24.ix.2009, 6 (w.), 7.x.2009, 6 (w.), 12.x.2009, 9 (w.), 21.x.2008, 27 (w.), 23.x.2008; Una, 11 (w.), 5.x.2008, 8 (w.), 15.x.2009. **Jammu and Kashmir:** Billawar, 1 (w.), 6.viii.2010; Jasrota, 1 (w.), 28.vii.2010; Kathua, 1 (w.), 23.vii.2010; Manda, 14 (w.), 15.vii.2009, 21 (w.), 2.viii.2010, 2 (w.), 4.viii.2010; Mansar, 3 (w.), 12.vii.2009, 2 (w.), 3.viii.2010; Samba, 1 (w.), 11.vii.2009; Surinsar, 1 (q.), 5 (m.), 14.vii.2009; Udampur, 1 (w.), 4.vii.2009. **Punjab:** Chohal, 27 (w.), 10.x.2008; Dharampur, 19 (w.), 14.x.2008; Dunera, 10 (w.), 23.vi.2009; Ropar, 7 (w.), 9.iv.2011. **Uttarakhand:** Assan Barrage, 4 (w.), 10.v.2009, 9 (w.), 2 (q.), 7 (m.), 3.vi.2010; Forest Research Institute, 4 (w.), 12.v.2009, 1 (w.), 2.viii.2009, 1 (w.), 3.viii.2009, 6 (w.), 26.v.2010; Rajaji Forest Area, 6 (w.), 10.viii.2009, 3 (w.), 21.v.2010, 9 (w.), 7.ix.2010; Ranger's College, 30 (w.), 22.v.2010; Selaqui, 3 (w.), 3.x.2008, 2 (w.), 7.viii.2009, 1 (w.), 8.viii.2009, 1 (w.), 24.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 84); Punjab (Tak and Rathore, 2004: 168; Bharti *et al.*, 2009: 39; Tak, 2009: 33, 2010: 139; Tak and Kazmi, 2011: 46), Uttarakhand (Forel, 1892: 240).

***Camponotus himalayanus* Forel, 1893**

*Camponotus marginatus* var. *himalayanus* Forel, 1893

**Type locality:** India: Himalaya

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Lwasa, 6 (w.), 27.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

***Camponotus horseshoetus* Datta and Raychaudhuri, 1985**

**Type locality:** India: West Bengal: Darjeeling

**Type depository:** NT: PUAC

**Material examined: Himachal Pradesh:** Baijnath, 9 (w.), 17.vi.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Wachkoo, 2015: 383).

***Camponotus kattensis* Bingham, 1903**

*Camponotus dichrous* var. *kattensis* Bingham, 1903

**Type locality:** India: Uttarakhand: Katapatthar

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Kotla, 1 (w.), 22.x.2008; Terrace, 2 (w.), 21.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1892: 243, 1906: 84).

***Camponotus lamarckii* Forel, 1892**

**Type locality:** India: Sikkim

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Andretta, 13 (w.), 11.vi.2010, 5 (w.), 2 (m.), 12.vi.2010, 3 (w.), 19.vi.2010, 1 (w.), 21.vi.2010; Baijnath, 3 (w.), 17.vi.2010; Bakhra, 1 (w.), 7.x.2008; Chanaur, 1 (w.), 20.x.2008; Nagabari, 54 (w.), 2 (q.), 14 (m.), 18.vi.2009; Mandi, 8 (w.), 27.vi.2010. **Uttarakhand:** Selaqui, 2 (w.), 3.x.2008, 1 (w.), 5.ix.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti, 2002a: 341), Uttarakhand (new record).

***Camponotus mitis* (Smith, 1858)**

*Formica mitis* Smith, 1858

**Type locality:** Sri Lanka

**Type depository:** ST: BMNH

**Material examined: Himachal Pradesh:** Andretta, 1 (q.), 11.vi.2010, 8 (w.), 1 (q.), 12.vi.2010, 5 (w.), 2 (m.), 13.vi.2010, 1 (w.), 15.vi.2010, 1 (w.), 21.vi.2010; Baijnath, 3 (w.), 23.vi.2010; Bakhra, 1 (w.), 7.x.2008; Chanaur, 12 (w.), 20.x.2008, 8 (w.), 1 (q.), 5.vi.2009; Dhaliara, 1 (w.), 2 (m.), 9.vi.2009; Gagret, 4 (w.), 17.x.2009; Ghamrur, 25 (w.), 1.vi.2009; Ghatti, 7 (w.), 11.x.2008; Guga, 2 (w.), 6.x.2008; Guraldhar, 11 (w.), 16.x.2008, 4 (w.), 4.x.2009; Khatiar, 4 (w.), 18.x.2008; Kotla, 8 (w.), 30.v.2009, 4 (w.), 29.ix.2009, 3 (w.), 13.x.2008; Lwasa, 8 (w.), 7.v.2009, 18 (w.), 1 (q.), 27.viii.2009; Mandi, 12 (w.), 1 (q.), 27.vi.2010; Nahan, 7 (w.), 23.viii.2009; Renuka, 11 (w.), 26.viii.2009; Siholi, 1 (w.), 19.x.2008, 12 (w.), 2.x.2009; Terrace, 1 (w.), 12.x.2008, 28 (w.), 24.v.2009, 7 (w.), 1 (m.), 26.v.2009; Una, 7 (w.), 15.x.2009. **Jammu and Kashmir:** Manda, 15 (w.), 15.vii.2009, 10 (w.), 4.viii.2010; Surinsar, 6 (w.), 14.vii.2009, 32 (w.), 1.viii.2010. **Punjab:** Chohal, 2 (w.), 10.x.2008; Dharampur, 1 (w.), 14.x.2008. **Uttarakhand:** Assan Barrage, 1 (w.), 3.vi.2010; Dakpathar, 21 (w.), 20.viii.2009; Forest Research Institute, 11 (w.), 12.v.2009, 1 (w.), 1 (q.), 13.v.2009, 11 (w.), 30.vii.2009, 4 (w.), 2.viii.2009, 1 (w.), 3.viii.2009, 23 (w.), 4.viii.2009, 6 (w.), 3 (q.), 1 (m.), 19.v.2010, 10 (w.), 1 (q.), 2 (m.), 20.v.2010; Rajaji Forest Area, 11 (w.), 5.viii.2009, 1 (w.), 10.viii.2009, 1 (w.), 11.viii.2009, 5 (w.), 2 (q.), 5 (m.), 21.v.2010; Selaqui, 4 (w.), 8.viii.2009, 6 (w.), 15.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (new record), Punjab (Tak, 2009: 35).



***Camponotus mutilarius* Emery, 1893**

**Type locality:** Myanmar: Carin Cheba

**Type depository:** ST: MSNG

**Material examined: Himachal Pradesh:** Andretta, 7 (w.), 1 (m.), 11.vi.2010, 1 (w.), 15.vi.2010; Bakhra, 9 (w.), 7.x.2008; Bari, 15 (w.), 6.vi.2009, 12 (w.), 1.x.2009, 7 (w.), 12.vii.2010; Gagret, 5 (w.), 17.x.2009; Kandwal, 2 (w.), 25.vi.2009; Kotla, 23 (w.), 13.x.2008, 15 (w.), 22.x.2008, 1 (w.), 30.v.2009; Mandi, 1 (w.), 27.vi.2010; Nagabari, 4 (w.), 18.vi.2009; Siholi, 1 (w.), 1 (q.), 8.vii.2010. **Jammu and Kashmir:** Kathua, 1 (w.), 23.vii.2010; Manda, 10 (w.), 2.viii.2010; Mansar, 2 (w.), 13.vii.2009. **Uttarakhand:** Forest Research Institute, 1 (w.), 11.v.2009, 7 (w.), 12.v.2009, 7 (w.), 30.vii.2009, 1 (w.), 16.viii.2009; Rajaji Forest Area, 1 (w.), 5.viii.2009, 11 (w.), 10.viii.2009, 2 (w.), 25.v.2010; Selaqui, 1 (w.), 24.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (Wachkoo, 2015: 383), Uttarakhand (Forel, 1895: 454; Wachkoo, 2015: 383).

***Camponotus nirvanae* Forel, 1893**

**Type locality:** India: Karnataka: Kanara; Maharashtra: Pune; Sri Lanka

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Bari, 2 (w.), 6.vi.2009, 1 (w.), 1.x.2009; Chanaur, 47 (w.), 1 (q.), 20.x.2008, 8 (w.), 5.vi.2009, 8 (w.), 12.vi.2009; Kotla, 1 (w.), 22.x.2008; Kushinagar, 2 (w.), 17.vi.2009; Nahan, 3 (w.), 6.v.2009; Terrace, 1 (w.), 24.v.2009, 8 (w.), 7.x.2009. **Jammu and Kashmir:** Mansar, 4 (w.), 12.vii.2009; Samba, 6 (w.), 11.vii.2009; Surinsar, 6 (w.), 14.vii.2009. **Uttarakhand:** Forest Research Institute, 1 (w.), 12.v.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (new record).

***Camponotus oblongus binominatus* Forel, 1916**

*Camponotus oblongus* var. *binominata* Forel, 1916

**Type locality:** India: Tamil Nadu: Tiruchirappalli

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Andretta, 19 (w.), 2 (q.), 12.vi.2010, 15 (w.), 1 (q.), 20.vi.2010; Baijnath, 1 (w.), 17.vi.2010; Bakhra, 13 (w.), 7.x.2008; Bari, 1 (w.), 15.x.2008; Guga, 12 (w.), 6.x.2008; Jogi Panga, 1 (w.), 9.x.2008; Khatiar, 1 (w.), 18.x.2008; Kotla, 16 (w.), 22.x.2008; Lwasa, 50 (w.), 27.viii.2009; Mandi, 8 (w.), 27.vi.2010; Rewalsar, 17 (w.), 29.vi.2010; Una, 15 (w.), 5.x.2008. **Jammu and Kashmir:** Billawar, 7 (w.), 6.viii.2010; Kathua, 2 (w.), 23.vii.2010; Surinsar, 16 (w.), 14.vii.2009, 19 (w.), 1.viii.2010. **Uttarakhand:** Forest Research Institute, 6 (w.), 4.viii.2009, 6 (w.), 16.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 84).

***Camponotus opaciventris* Mayr, 1879**

**Type locality:** India: West Bengal: Kolkata

**Type depository:** ST: NHMW

**Material examined: Himachal Pradesh:** Andretta, 2 (w.), 11.vi.2010, 1 (w.), 12.vi.2010, 1 (w.), 15.vi.2010, 15 (w.), 19.vi.2010; Baijnath, 3 (w.), 23.vi.2010; Bari, 13 (w.), 15.x.2008, 1 (w.), 12.vii.2010; Dehra, 1 (w.), 6.vii.2010; Gagret, 1 (w.), 17.x.2009; Guga, 10 (w.), 6.x.2008; Guraldhar, 5 (w.), 16.x.2008; Jogi Panga, 15 (w.), 9.x.2008; Khatiar, 3 (w.), 11.x.2009; Kotla, 1 (w.), 30.v.2009, 3 (w.), 29.ix.2009; Kushinagar, 1 (w.), 17.vi.2009; Nahan, 10 (w.), 4.vi.2010; Pong Dam, 1 (w.), 18.x.2009; Siholi, 1 (w.), 8.vii.2010; Terrace, 1 (w.), 12.x.2009, 1 (w.), 15.vii.2010; Una, 5 (w.), 5.x.2008. **Jammu and Kashmir:** Mansar, 1 (w.), 3.viii.2010; Sukrala, 1 (q.), 7.viii.2010; Udhampur, 2 (w.), 4.vii.2009. **Punjab:** Dunera, 1 (w.), 23.vi.2009,

7 (w.), 1 (q.), 2 (m.), 24.vii.2010. **Uttarakhand:** Assan Barrage, 12 (w.), 10.v.2009, 1 (w.), 21.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1892: 231; Wachkoo and Akbar, 2016: 4), Jammu and Kashmir, Punjab, Uttarakhand (Wachkoo and Akbar, 2016: 6).

***Camponotus parabarbatus* Bharti and Wachkoo, 2014**

**Type locality:** India: Himachal Pradesh: Rewalsar; Uttarakhand:

Forest Research Institute, Rajaji Forest Area

**Type depository:** HT, PT: PUAC

**Material examined: Himachal Pradesh:** Rewalsar, 3 (w.), 3 (q.), 30.vi.2010. **Uttarakhand:** Forest Research Institute, 6 (w.), 1.viii.2009; Rajaji Forest Area, 8 (w.), 10.viii.2009, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bharti and Wachkoo, 2014a: 3).

***Camponotus parius* Emery, 1889**

*Camponotus micans* r. *paria* Emery, 1889

**Type locality:** Myanmar: Bhamo: Yangon; Sri Lanka

**Type depository:** MSNG

**Material examined: Himachal Pradesh:** Andretta, 2 (w.), 1 (q.), 12.vi.2010, 1 (w.), 15.vi.2010, 8 (w.), 20.vi.2010; Baijnath, 9 (w.), 23.vi.2010; Bakhra, 12 (w.), 7.x.2008; Bari, 12 (w.), 15.x.2008, 3 (w.), 6.vi.2009; Chanaur, 21 (w.), 20.x.2008, 2 (w.), 5.vi.2009, 3 (w.), 12.vi.2009, 1 (w.), 3.x.2009; Dhaliara, 4 (w.), 9.vi.2009; Gagret, 11 (w.), 8.x.2008, 2 (w.), 17.x.2009; Ghamrur, 7 (w.), 1.vi.2009; Ghatti, 13 (w.), 11.x.2008, 10 (w.), 28.ix.2009, 1 (w.), 13.x.2009, 1 (w.), 10.vii.2010; Guga, 9 (w.), 6.x.2008; Guraldhar, 14 (w.), 16.x.2008, 5 (w.), 2.vi.2009; Jassur, 28 (w.), 8.vi.2009; Jogi Panga, 19 (w.), 9.x.2008; Kandwal, 2 (w.), 25.vi.2009; Khatiar, 5 (w.), 18.x.2008, 2 (w.), 3.vi.2009, 1 (w.), 11.x.2009; Kotla, 17 (w.), 13.x.2008, 3 (w.), 22.x.2008, 2 (w.), 28.v.2009, 7 (w.), 30.v.2009, 2 (w.), 29.ix.2009; Kushinagar, 4 (w.), 17.vi.2009; Mandi, 8 (w.), 27.vi.2010; Nagabari, 5 (w.), 18.vi.2009; Nahan, 4 (w.), 6.v.2009, 1 (w.), 23.viii.2009, 1 (w.), 4.vi.2010; Poanta Sahib, 5 (w.), 9.v.2009; Pong Dam, 15 (w.), 17.x.2008; Siholi, 31 (w.), 19.x.2008, 17 (w.), 4.vi.2009, 1 (w.), 2.x.2009, 1 (w.), 14.x.2009; Terrace, 14 (w.), 12.x.2008, 20 (w.), 21.x.2008, 15 (w.), 23.x.2008, 3 (w.), 24.v.2009, 2 (w.), 25.v.2009, 11 (w.), 13.vi.2009, 2 (w.), 23.ix.2009, 3 (w.), 24.ix.2009, 2 (w.), 25.ix.2009, 2 (w.), 7.x.2009, 2 (w.), 12.x.2009; Una, 1 (w.), 5.x.2008, 3 (w.), 15.x.2009. **Jammu and Kashmir:** Kathua, 1 (w.), 23.vii.2010; Mansar, 1 (w.), 12.vii.2009; Udhampur, 5 (w.), 4 (q.), 1 (m.), 4.vii.2009. **Punjab:** Chohal, 21 (w.), 10.x.2008; Dharampur, 8 (w.), 14.x.2008; Dunera, 9 (w.), 21.vi.2009, 1 (w.), 23.vi.2009; Thein Dam, 10 (w.), 24.vi.2009. **Uttarakhand:** Assan Barrage, 2 (w.), 10.v.2009, 1 (w.), 3.vi.2010; Forest Research Institute, 3 (w.), 11.v.2009, 1 (w.), 12.v.2009, 2 (w.), 13.v.2009, 4 (w.), 2.viii.2009, 1 (w.), 3.viii.2009, 2 (w.), 14.viii.2009, 1 (w.), 16.viii.2009; Rajaji Forest Area, 8 (w.), 5.viii.2009, 1 (w.), 12.viii.2009, 1 (w.), 21.v.2010; Ranger's College, 5 (w.), 22.v.2010, 1 (w.), 11 (m.), 8.vi.2010; Selaqui, 3 (w.), 2.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 84), Punjab (Imai *et al.*, 1984: 9; Bharti *et al.*, 2009: 39).

***Camponotus sylvaticus basalis* Smith, 1878**

*Camponotus basalis* Smith, F., 1878

*Camponotus maculatus* r. *lobinieri* Forel, 1902

**Type locality:** India: Jammu and Kashmir: Sind Valley, Kashmir

**Type depository:** ST: BMNH

**Material examined: Himachal Pradesh:** Andretta, 9 (w.), 1 (q.), 1 (m.), 15.vi.2010; Guga, 5 (w.), 6.x.2008. **Punjab:** Chohal, 2 (w.), 10.x.2008. **Uttarakhand:** Selaqui, 9 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh,



Punjab and Uttarakhand (new record), Jammu and Kashmir (Emery, 1896: 776; Forel, 1902a: 287).

### ***Cataglyphis setipes* (Forel, 1894)**

*Myrmecocystus viaticus* r. *setipes* Forel, 1894

*Myrmecocystus viaticus* subsp. *setipes* var. *setipedesertorum* Ruzsky, 1905

*Cataglyphis bicolor* var. *turcomanica* Crawley, 1920

*Cataglyphis setipes* subsp. *dschambulica* Tarbinsky, 1976

**Type locality:** India: Rajasthan: Nusseerabad, Rajpootana

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Andretta, 3 (w.), 21.vi.2010; Jogi Panga, 2 (w.), 9.ix.2008; Khatiar, 21 (w.), 1 (q.), 6 (m.), 11.x.2009, 9 (w.), 3.vi.2009; Kotla, 5 (w.), 13.x.2008; Nahan, 1 (w.), 23.viii.2009; Poanta Sahib, 2 (w.), 19.viii.2009; Renuka, 3 (w.), 26.viii.2009; Terrace, 1 (w.), 25.v.2009. **Jammu and Kashmir:** Manda, 3 (w.), 4.viii.2010; Mansar, 1 (w.), 3.viii.2010; Surinsar, 3 (w.), 14.vii.2009. **Uttarakhand:** Ranger's College, 3 (w.), 27.v.2010; Selaqui, 1 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (Wachkoo and Bharti, 2015a: 3), Punjab (Imai *et al.*, 1984: 9; Tak and Rathore, 2004: 171; Bharti *et al.*, 2009: 39).

### ***Lepisiota bipartita* (Smith, 1861)**

*Formica bipartita* Smith, 1861

**Type locality:** Israel: Holy Land

**Type depository:** ST: BMNH

**Material examined:** **Himachal Pradesh:** Baijnath, 9 (w.), 17.vi.2010; Bakhra, 21 (w.), 7.x.2008; Ghamrur, 9 (w.), 1.vi.2009; Ghatti, 1 (w.), 12.x.2008; Guraldhar, 15 (w.), 2.vi.2009; Jogi Panga, 13 (w.), 9.x.2008; Renuka, 5 (w.), 8.v.2009; Terrace, 10 (w.), 24.v.2009, 20 (w.), 25.v.2009, 2 (w.), 9.vii.2010. **Jammu and Kashmir:** Manda, 8 (w.), 15.vii.2009; Mansar, 4 (w.), 13.vii.2009. **Punjab:** Chohal, 17 (w.), 11.x.2008. **Uttarakhand:** Forest Research Institute, 3 (w.), 11.v.2009, 3 (w.), 12.v.2009; Ranger's College, 20 (w.), 22.v.2010, 9 (w.), 25.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1894: 414), Punjab (Tak and Rathore, 2004: 172), Jammu and Kashmir and Uttarakhand (new record).

### ***Lepisiota capensis* (Mayr, 1862)**

*Acantholepis capensis* Mayr, 1862

**Type locality:** South Africa: Cape of Good Hope

**Type depository:** NHMW

**Material examined:** **Himachal Pradesh:** Andretta, 1 (w.), 21.vi.2010; Baijnath, 3 (w.), 17.vi.2010; Kotla, 1 (w.), 13.x.2008; Palampur, 2 (w.), 18.vi.2010; Nahan, 2 (w.), 27.viii.2009; Renuka, 1 (w.), 8.v.2009; Terrace, 1 (w.), 24.v.2009. **Uttarakhand:** Forest Research Institute, 3 (w.), 2.ix.2009; Rajaji Forest Area, 3 (w.), 21.v.2010; Selaqui, 1 (w.), 24.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 85); Uttarakhand (Forel, 1894: 414).

### ***Lepisiota capensis lunaris* (Emery, 1893)**

*Acantholepis lunaris* Emery, 1893

**Type locality:** Sri Lanka: Colombo

**Type depository:** ST: MSNG

**Material examined:** **Himachal Pradesh:** Bari, 3 (w.), 6.vi.2009; Ghatti, 3 (w.), 12.x.2008; Guga, 2 (w.), 22.x.2008; Jassur, 6 (w.), 6.vi.2009; Kotla, 5 (w.), 22.x.2008; Palampur, 4 (w.), 18.vi.2010; Nagabari, 3 (w.), 18.vi.2009; Terrace, 4 (w.), 12.x.2009. **Punjab:** Dunera, 3 (w.), 24.vii.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Punjab (new record).

### ***Lepisiota frauenfeldi integra* (Forel, 1894)**

*Acantholepis frauenfeldi* var. *integra* Forel, 1894

**Type locality:** India: Himachal Pradesh: Dharamsala

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Andretta, 1 (w.), 11.vi.2010, 1 (w.), 27.viii.2009. **Jammu and Kashmir:** Manda, 1 (w.), 500m, 15.vii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1906: 86), Jammu and Kashmir (Bharti *et al.*, 2013a: 85), Punjab (Bharti *et al.*, 2009: 39).

### ***Lepisiota modesta* (Forel, 1894)**

*Acantholepis modesta* Forel, 1894

**Type locality:** India: Uttarakhand: Mussoorie

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Lwasa, 17 (w.), 27.viii.2009. **Punjab:** Dunera, 3 (w.), 24.vii.2010. **Uttarakhand:** Mussoorie, 37 (w.), 9.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Punjab (new record), Uttarakhand (Forel, 1894: 414; Bharti, 2002b: 356).

### ***Lepisiota opaca* (Forel, 1892)**

*Acantholepis opaca* Forel, 1892

**Type locality:** India: Karnataka: Kanara

**Type depository:** ST: MHNG, MSNG

**Material examined:** **Himachal Pradesh:** Andretta, 4 (w.), 11.vi.2010; Ghatti, 1 (w.), 12.x.2008, 3 (w.), 28.ix.2009, 6 (w.), 27.ix.2009, Kotla, 1 (w.), 22.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 85).

### ***Lepisiota opaca pulchella* (Forel, 1892)**

*Acantholepis opaca* r. *pulchella* Forel, 1892

**Type locality:** India: Maharashtra: Pune

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Andretta, 3 (w.), 11.vi.2010, 9 (w.), 11.vi.2010; Chanaur, 5 (w.), 12.vi.2009, 5 (w.), 20.x.2008; Ghatti, 6 (w.), 12.x.2008; Guraldhar, 1 (w.), 2.vi.2009, 2 (w.), 10.vi.2009; Khatiar, 7 (w.), 18.x.2008, 1 (w.), 3.vi.2009; Kotla, 8 (w.), 13.x.2008, 3 (w.), 22.x.2008, 5 (w.), 28.v.2009; Lwasa, 12 (w.), 7.viii.2009; Nahan, 13 (w.), 20.viii.2009, 9 (w.), 27.viii.2009; Siholi, 1 (w.), 4.vi.2009; Terrace, 36 (w.), 11.x.2008, 1 (w.), 21.x.2008, 4 (w.), 26.v.2009, 1 (w.), 13.vi.2009, 11 (w.), 24.ix.2009, 10 (w.), 25.ix.2009. **Jammu and Kashmir:** Manda, 7 (w.), 15.vii.2009; Mansar, 1 (w.), 12.vii.2009, 1 (w.), 13.vii.2009; Samba, 2 (w.), 11.vii.2009; Surinsar, 2 (w.), 14.vii.2009. **Punjab:** Dharampur, 2 (w.), 14.x.2008; Dunera, 1 (w.), 23.vi.2009; Thein Dam, 1 (w.), 24.vi.2009. **Uttarakhand:** Dakpathar, 1 (w.), 20.viii.2009; Forest Research Institute, 1 (w.), 17.viii.2009; Mussoorie, 2 (w.), 13.vii.2009; Rajaji Forest Area, 39 (w.), 6.viii.2009, 4 (w.), 10.viii.2009, 1 (w.), 13.viii.2009; Selaqui, 1 (w.), 7.viii.2009, 2 (w.), 24.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 85), Punjab (Bharti *et al.*, 2009: 39).

### ***Lepisiota rothneyi* (Forel, 1894)**

*Plagiolepis rothneyi* Forel, 1894

**Type locality:** India: Karnataka: Belgaum; West Bengal:

Barrakpore

**Type depository:** ST: MHNG

**Material examined:** **Uttarakhand:** Forest Research Institute, 6 (w.), 11.v.2009, 1 (w.), 13.v.2009, 1 (w.), 30.vii.2009, 2 (w.), 26.v.2010; Rajaji Forest Area, 1 (w.), 5.viii.2009, 2 (w.), 6.viii.2009, 4 (w.), 11.viii.2009, 1 (w.), 6.ix.2009; Selaqui, 4 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.



## Ants in Northwestern Shivalik

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

### *Lepisiota rothneyi wroughtonii* (Forel, 1902)

*Plagiolepis rothneyi* r. *wroughtonii* Forel, 1902

**Type locality:** India: Tamil Nadu: Ooty, Nilgiris

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Khatiar, 3 (w.), 18.x.2008; Poanta Sahib, 4 (w.), 11.v.2009. **Uttarakhand:** Assan Barrage, 3 (w.), 21.viii.2009; Forest Research Institute, 3 (w.), 1.x.2008, 2 (w.), 12.v.2009, 2 (w.), 30.vii.2009, 2 (w.), 20.v.2010, 4 (w.), 26.v.2010; Rajaji Forest Area, 4 (w.), 6.viii.2009, 4 (w.), 10.viii.2009, 3 (w.), 25.v.2010; Ranger's College, 8 (w.), 25.v.2010, 1 (w.), 27.v.2010; Selaqui, 6 (w.), 24.v.2010, 10 (w.), 7.viii.2009, 1 (w.), 5.ix.2010, leg.. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### *Lepisiota sericea* (Forel, 1892)

*Acantholepis frauenfeldi* var. *sericea* Forel, 1892

**Type locality:** India: Uttarakhand: Mussoorie

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Andretta, 9 (w.), 21.vi.2010; Baijnath, 6 (w.), 17.vi.2010; Lwasa, 6 (w.), 27.viii.2009; Palampur, 7 (w.), 18.vi.2010. **Jammu and Kashmir:** Surinsar, 10 (w.), 14.vii.2009. **Uttarakhand:** Mussoorie, 7 (w.), 9 .viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (new record), Uttarakhand (Forel, 1894: 413).

### *Lepisiota simplex* (Forel, 1892)

*Acantholepis simplex* Forel, 1892

**Type locality:** Africa: Somalia

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Andretta, 6 (w.), 12.vi.2010; Renuka, 3 (w.), 8.v.2009; Terrace, 1 (w.), 11.x.2008, 1 (w.), 23.x.2008. **Jammu and Kashmir:** Mansar, 3 (w.), 13.vii.2009. **Punjab:** Dharampur, 5 (w.), 14.x.2008. **Uttarakhand:** Dakpathar, 5 (w.), 20.viii.2009; Forest Research Institute, 1 (w.), 1.x.2008, 1 (w.), 4.viii.2009; Mussoorie, 3 (w.), 9.viii.2009; Selaqui, 3 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand (new record).

### *Lepisiota* sp.

**Material examined: Himachal Pradesh:** Kotla 1 (w.), 22.x.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh.

### *Nylanderia birmana* (Forel, 1902)

*Prenolepis birmana* Forel, 1902

**Type locality:** Myanmar: Mawlamyine

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Palampur, 27 (w.), 1 (q.), 18.vi.2010; **Uttarakhand:** Forest Research Institute, 43 (w.), 30.ix.2008; 37 (w.), 1.x.2008; Selaqui, 44 (w.), 3.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Wachkoo and Bharti, 2015b: 106).

### *Nylanderia himalayana* Wachkoo and Bharti, 2015

**Type locality:** India: Himachal Pradesh: Rewalsar

**Type depository:** HT: PUAC; PT: CASC

**Material examined:** Himachal Pradesh: Rewalsar, 3 (w.), 30.vi.2010, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wachkoo and Bharti, 2015b: 111).

### *Nylanderia indica* (Forel, 1894)

*Prenolepis indica* Forel, 1894

**Type locality:** India: Maharashtra: Pune, South Konkan; Sri Lanka

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Lwasa, 16 (w.), 27.viii.2009; Nahan, 5 (w.), 27.ix.2009; Terrace, 5 (w.), 24.ix.2009. **Uttarakhand:** Dakpathar, 9 (w.), 20.viii.2009; Rajaji Forest Area, 10 (w.), 5 (q.), 5.viii.2009; Selaqui, 9 (w.), 9.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wachkoo and Bharti, 2015b: 112), Uttarakhand (Imai *et al.*, 1984: 9; Wachkoo and Bharti, 2015b: 112).

### *Nylanderia smythiesii* (Forel, 1894)

*Prenolepis smythiesii* Forel, 1894

**Type locality:** India: Uttarakhand: Dehradun

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Andretta, 13 (w.), 21.vi.2010; Baijnath, 110 (w.), 17.vi.2010; Bakhra, 1 (w.), 7.x.2008; Bilaspur, 99 (w.), 1.vii.2010; Chanaur, 204 (w.), 20.x.2008; Kotla, 19 (w.), 30.ix.2009, 9 (w.), 13.vii.2010; Lwasa, 20 (w.), 27.viii.2009; Nagabari, 6 (w.), 18.vi.2009; Nahan, 3 (w.), 27.ix.2009; Poanta Sahib, 216 (w.), 9.v.2009, 171 (w.), 19.viii.2009; Renuka, 8 (w.), 26.viii.2009; Terrace, 5 (w.), 13.vi.2009, 2 (w.), 24.ix.2009, 4 (w.), 19.vii.2010. **Jammu and Kashmir:** Mansar, 3 (w.), 13.vii.2009; Surinsar, 12 (w.), 14.vii.2009. **Punjab:** Chohal, 1 (w.), 8.x.2008. **Uttarakhand:** Assan Barrage, 204 (w.), 3.vi.2010; Dakpathar, 11 (w.), 20.viii.2009; Forest Research Institute, 12 (w.), 30.ix.2008, 1 (w.), 2.x.2008, 16 (w.), 31.vii.2009; Rajaji Forest Area, 5 (w.), 1 (q.), 9 (m.), 5.viii.2009, 21 (w.), 11.viii.2009, 18 (w.), 7.ix.2010; Selaqui, 7 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Punjab (Wachkoo and Bharti, 2014a: 3, 2015b: 114), Uttarakhand (Forel, 1894: 410, 1906: 86; Wachkoo and Bharti, 2014a: 3, 2015b: 114).

### *Nylanderia taylori* (Forel, 1894)

*Prenolepis taylori* Forel, 1894

**Type locality:** India: Odisha

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Lwasa, 1 (w.), 27.viii.2009; Kushinagar, 6 (w.), 3 (q.), 17.vi.2009. **Uttarakhand:** Dakpathar, 4 (w.), 20.viii.2009; Rajaji Forest Area, 3 (w.), 5.viii.2009; Selaqui, 1 (w.), 9.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Wachkoo and Bharti, 2015b: 116), Jammu and Kashmir (Bharti *et al.*, 2013a: 85).

### *Nylanderia yerburyi* (Forel, 1894)

*Prenolepis yerburyi* Forel, 1894

**Type locality:** India: Tamil Nadu: Coonoor; Sri Lanka

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Terrace, 7 (w.), 24.v.2009, 18 (w.), 1 (q.), 1 (m.), 26.v.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wachkoo and Bharti, 2015b: 117).

### *Oecophylla smaragdina* (Fabricius, 1775)

*Formica smaragdina* Fabricius, 1775

*Formica virescens* Fabricius, 1775

*Formica viridis* Kirby, 1819



*Formica macra* Guérin-Méneville, 1831

*Formica zonata* Guérin-Méneville, 1838

**Type locality:** India

**Type depository:** ST: ZMUK

**Material examined: Himachal Pradesh:** Nahan, 21 (w.), 6.v.2009, 7 (w.), 4.vi.2010. **Jammu and Kashmir:** Surinsar, 6 (w.), 14.vii.2009. **Punjab:** Sukhna, 90 (w.), 5.x.2010. **Uttarakhand:** Dakpathar, 1 (w.), 20.viii.2009; Forest Research Institute, 9 (w.), 11.v.2009, 7 (w.), 12.v.2009, 1 (w.), 26.v.2010, 2 (w.), 16.viii.2009; Rajaji Forest Area, 13 (w.), 10.viii.2009, 1 (w.), 11.viii.2009, 8 (w.), 6.ix.2010; Ranger's College, 1 (w.), 27.v.2010, Selaqui, 11 (w.), 3.x.2008, 5 (w.), 24.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 85), Punjab (Tak and Rathore, 2004: 172; Bharti *et al.*, 2009: 39; Bharti and Kaur, 2011: 16; Tak, 2009: 39; Tak and Kazmi, 2011: 47), Uttarakhand (Forel, 1894: 401; Mukherji and Ribeiro, 1925: 208; Tak and Rathore, 2004: 172).

### *Paratrechina longicornis* (Latreille, 1802)

*Formica longicornis* Latreille, 1802

*Formica vagans* Jerdon, 1851

*Formica gracilescens* Nylander, 1856

*Paratrechina currens* Motschoulsky, 1863

*Prenolepis longicornis* var. *agemanni* Forel, 1901

**Type locality:** Thailand: Bangkok

**Type depository:** NT: ANIC

**Material examined: Himachal Pradesh:** Bari, 30 (w.), 15.x.2008, 11 (w.), 6.vi.2009; Chanaur, 18 (w.), 20.x.2008, 8 (w.), 5.vi.2009, 33 (w.), 3.x.2009; Ghamrur, 10 (w.), 1.vi.2009; Ghatti, 21 (w.), 12.x.2008, 1 (w.), 28.ix.2009; Guga, 4 (w.), 6.x.2008; Guraldhar, 1 (w.), 16.x.2008, 2 (w.), 2.vi.2009; Jogi Panga, 22 (w.), 9.x.2008; Khatiar, 6 (w.), 11.x.2009; Kotla, 25 (w.), 13.x.2008, 1 (w.), 28.v.2009, 39 (w.), 30.v.2009, 1 (w.), 30.ix.2009; Kushinagar, 12 (w.), 1 (q.), 17.vi.2009; Nahan, 33 (w.), 4 (q.), 6.v.2009, 22 (w.), 23.viii.2009; Poanta Sahib, 47 (w.), 19.viii.2009, 4 (w.), 2.vi.2010; Pong Dam, 14 (w.), 17.x.2008; Siholi, 13 (w.), 19.x.2008; Suketi, 2 (w.), 25.viii.2009; Terrace, 25 (w.), 11.x.2008, 32 (w.), 21.x.2008, 1 (w.), 25.ix.2009, 8 (w.), 3.x.2009, 1 (w.), 19.vii.2010. **Jammu and Kashmir:** Jasrota, 3 (w.), 28.vii.2010; Mansar, 2 (w.), 3.viii.2010; Samba, 21 (w.), 11.vii.2009. **Punjab:** Chohal, 35 (w.), 8.x.2008; Dunera, 21 (w.), 23.vi.2009. **Uttarakhand:** Assan Barrage, 15 (w.), 21.viii.2009; Rajaji Forest Area, 3 (w.), 6.viii.2009; Selaqui, 1 (w.), 3.x.2008, 2 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 85), Punjab (Imai *et al.*, 1984: 9; Bharti *et al.*, 2009: 39), Uttarakhand (Forel, 1894: 408).

### *Plagiolepis dichroa* Forel, 1902

**Type locality:** India: West Bengal: Barrackpore

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Kushinagar, 1 (w.), 17.vi.2009. **Jammu and Kashmir:** Mansar, 2 (w.), 13.vii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 85).

### *Plagiolepis jerdonii* Forel, 1894

**Type locality:** India: Maharashtra: Pune

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Andretta, 10 (w.), 20.vi.2010; Baijnath, 7 (w.), 17.vi.2010; Dehra, 6 (w.), 7.vii.2010; Dhaliara, 17 (w.), 9.vi.2009; Guraldhar, 6 (w.), 16.x.2008; Jogi Panga, 5 (w.), 9.x.2008; Khatiar, 21 (w.), 18.x.2008, 1 (w.), 3.vi.2009; Kotla, 2 (w.), 13.x.2008, 1 (w.) 22.x.2008; Lwasa, 8

(w.), 7.v.2009, 11 (w.), 6 (q.), 2 (m.), 27.viii.2009; Renuka, 3 (w.), 8.v.2009, 2 (w.), 26.viii.2009; Siholi, 14 (w.), 19.x.2008; Terrace, 12 (w.), 12.x.2008, 26 (w.), 23.v.2009, 103 (w.), 25.v.2009, 10 (w.), 23.ix.2009, 18 (w.), 25.ix.2009, 7 (w.), 17.vii.2010, 3 (w.), 19.vii.2010. **Jammu and Kashmir:** Kathua, 5 (w.), 21.vii.2010, Manda, 27 (w.), 4.viii.2010; Mansar, 1 (w.), 12.vii.2009, 6 (w.), 1 (q.), 13.vii.2009, 3 (w.), 3.viii.2010; Samba, 12 (w.), 11.vii.2009; Surinsar, 2 (w.), 14.vii.2009. **Punjab:** Dharampur, 4 (w.), 14.x.2008. **Uttarakhand:** Assan Barrage, 5 (w.), 3.vi.2010; Forest Research Institute, 64 (w.), 12.v.2009; Rajaji Forest Area, 92 (w.), 11.viii.2009; Selaqui, 84 (w.), 8.viii.2009, 11 (w.), 15.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Punjab and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 85).

### *Plagiolepis* sp.

**Material examined: Uttarakhand:** Forest Research Institute, 2 (w.), 13.v.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Uttarakhand.

### *Polyrhachis exercita lucidiventris* Forel, 1907

**Type locality:** India: Kerala: Kochi

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Gagret, 2 (w.), 8.x.2008; Jogi Panga, 4 (w.), 9.x.2008, Khatiar, 1 (w.), 18.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

### *Polyrhachis exercita obtusisquama* Forel, 1902

**Type locality:** Maharashtra: Thane; Odisha

**Type depository:** ST: MHNG, NHMB

**Material examined: Himachal Pradesh:** Dehra, 7 (w.), 6.vii.2010; Siholi, 41 (w.), 14.x.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

### *Polyrhachis illaudata* Walker, 1859

*Polyrhachis mayri* Roger, 1863

*Polyrhachis duodentata* Donisthorpe, 1942

*Polyrhachis latispinosa* Donisthorpe, 1942

**Type locality:** Sri Lanka

**Type depository:** HT: BMNH

**Material examined: Himachal Pradesh:** Andretta, 1 (w.), 11.vi.2010, 4 (w.), 12.vi.2010. **Uttarakhand:** Forest Research Institute, 1 (w.), 11.v.2009, 12 (w.), 12.v.2009, 2 (w.), 30.vii.2009, 1 (w.), 31.vii.2009, 1 (w.), 1.viii.2009, 1 (w.), 3.viii.2009, 1 (w.), 14.viii.2009, 65 (w.), 2 (q.), 26.v.2010; Rajaji Forest Area, 1 (w.), 1 (q.), 5.viii.2009, 1 (w.), 6.viii.2009, 7 (w.), 11.viii.2009; Selaqui, 2 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 85).

### *Polyrhachis lacteipennis* Smith, 1858

*Polyrhachis simplex* Mayr, 1862

*Polyrhachis spiniger* Mayr, 1879

**Type locality:** North India

**Type depository:** HT: BMNH

**Material examined: Himachal Pradesh:** Andretta, 6 (w.), 1 (q.), 2 (m.), 12.vi.2010; Bakhra, 1 (w.), 7.x.2008; Ghatti, 3 (w.), 2 (q.), 3 (m.) 10.vii.2010; Guga, 4 (w.), 6.x.2008; Jogi Panga, 4 (w.), 9.x.2008; Kotla, 1 (w.), 13.x.2008; Renuka, 2 (w.), 26.viii.2009; Rewalsar, 4 (w.), 29.vi.2010; Terrace, 3 (w.), 12.x.2009; Una, 2 (w.), 5.x.2008. **Jammu and Kashmir:** Manda, 2 (w.), 4.viii.2010; Mansar, 4 (w.), 2 (q.), 3 (m.), 13.vii.2009; Surinsar, 1 (w.),



## Ants in Northwestern Shivalik

14.vii.2009. **Punjab:** Dharampur, 1 (w.), 14.x.2008. **Uttarakhand:** Forest Research Institute, 1 (w.), 11.v.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 85), Punjab (Imai *et al.*, 1984: 9; Bharti *et al.*, 2009: 39), Uttarakhand (Forel, 1893: 34).

### *Polyrhachis menelas* Forel, 1904

**Type locality:** India: Uttarakhand: Dehradun

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Andretta, 1 (w.), 11.vi.2010, 11 (w.), 12.vi.2010, 2 (w.), 13.vi.2010; Bakhra, 10 (w.), 7.x.2008; Bari, 4 (w.), 15.x.2008, 1 (w.), 6.vi.2009; Chanaur, 21 (w.), 20.x.2008, 2 (w.), 5.vi.2009, 5 (w.), 12.vi.2009, 11 (w.), 3.x.2009; Ghatti, 31 (w.), 28.ix.2009, 1 (q.), 10.vii.2010; Guga, 1 (w.), 6.x.2008; Guraldhar, 2 (w.), 16.x.2008, 3 (w.), 2.vi.2009; Jogi Panga, 41 (w.), 9.x.2008, Khatiar, 7 (w.), 11.x.2009, 27 (w.), 18.x.2008; Kotla, 2 (w.), 13.x.2008, 23 (w.), 22.x.2008, 7 (w.), 28.v.2009, 2 (w.), 19.vi.2009; Kushinagar, 8 (w.), 17.vi.2009; Nahan, 2 (w.), 23.viii.2009, 11 (w.), 2 (q.), 4.vi.2010; Renuka, 1 (w.), 26.viii.2009; Rewalsar, 1 (w.), 29.vi.2010; Terrace, 16 (w.), 21.x.2008, 3 (w.), 26.v.2009, 1 (w.), 12.x.2009; Una, 10 (w.), 5.x.2008. **Jammu and Kashmir:** Jasrota, 1 (w.), 28.vii.2010; Mansar, 2 (w.), 13.vii.2009; Sukrala, 2 (w.), 7.viii.2010; Kathua, 1 (w.), 29.vii.2010. **Punjab:** Dharampur, 1(w.), 14.x.2008. **Uttarakhand:** Assan Barrage, 4 (w.), 3.v.2010, 2 (w.), 10.v.2009; Ranger's College, 2 (w.), 25.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand (new record).

### *Polyrhachis punctillata fergusonii* Forel, 1902

**Type locality:** India: Kerala: Travancore

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Guga, 1 (w.), 6.x.2008; Bari, 1 (w.) 15.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

### *Polyrhachis punctillata smythiesii* Forel, 1895

**Type locality:** India: Uttarakhand: Dehradun

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Andretta, 1 (w.), 11.vi.2010; Bari, 1 (w.), 12.vii.2010; Jol, 1 (w.), 6.x.2009; Khatiar, 2 (w.), 18.x.2008; Kotla, 1 (w.), 30.ix.2009; Nahan, 2 (w.), 23.viii.2009, 1 (w.), 27.viii.2009; Siholi, 1 (w.), 1.x.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2013a: 85), Uttarakhand (Forel, 1895: 456, 1906: 85).

### *Polyrhachis tibialis caligata* Emery, 1895

**Type locality:** Myanmar: Carin Cheba

**Type depository:** MNHN, MSNG

**Material examined:** **Uttarakhand:** Forest Research Institute, 1 (w.), 11.v.2009, 10 (w.), 12.v.2009, 11 (w.), 30.viii.2009, Rajaji Forest Area, 4 (w.), 25.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

### *Prenolepis fisheri* Bharti and Wachkoo, 2012

**Type locality:** India: Uttarakhand: Forest Research Institute

**Type depository:** HT, PT: PUAC; PT: BMNH

**Type Material:** Uttarakhand: Forest Research Institute, 8 (w.), 1 (q.), 11.v.2009, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Uttarakhand (Bharti and

Wachkoo, 2012b: 120).

### *Prenolepis naoroji* Forel, 1902

**Type locality:** India: Assam

**Type depository:** ST: MHNG

**Material examined:** **Himachal Pradesh:** Andretta, 6 (w.), 11.vi.2010, 12 (w.), 15.vi.2010, 14 (w.), 3 (m.), 19.vi.2010, 12 (w.), 20.vi.2010, 4 (w.), 21.vi.2010; Dattal, 5 (w.), 16.vi.2010; Ghatti, 5 (w.), 28.ix.2009; Guga, 4 (w.), 6.x.2008; Guradhar, 1 (w.), 4.x.2009; Kotla, 33 (w.), 13.x.2008, 13 (w.), 30.v.2009, 4 (w.), 29.ix.2009; Lwasa, 12 (w.), 1 (q.), 27.viii.2009; Nahan, 6 (w.), 13.viii.2009. **Jammu and Kashmir:** Manda, 17 (w.), 4.viii.2010; Mansar, 3 (w.), 3.viii.2010; Samba, 2 (w.), 11.vii.2009; Surinsar, 11 (w.), 14.vii.2009. **Punjab:** Dharampur, 2 (w.), 14.x.2008. **Uttarakhand:** Dakpathar, 4 (w.), 20.viii.2009; Forest Research Institute, 1 (w.), 30.ix.2008, 20 (w.), 1.x.2008, 23 (w.), 30.vii.2009, 1 (w.), 12.v.2009, 3 (w.), 17.viii.2009, 21 (w.), 2.ix.2009, 2 (w.), 4.ix.2010; Rajaji Forest Area, 15 (w.), 5.viii.2009, 1 (w.), 6.viii.2009, 2 (w.), 10.viii.2009, 2 (w.), 11.viii.2009, 15 (w.), 25.v.2010; Selaqui, 1 (w.), 2.x.2008, 13 (w.), 3.x.2008, 7 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti, 2002a: 343; Bharti and Wachkoo, 2012b: 122), Jammu and Kashmir (Bharti *et al.*, 2013a: 86; Bharti and Wachkoo, 2012b: 122), Punjab and Uttarakhand (Bharti and Wachkoo, 2012b: 122).

### *Pseudolasius diversus* Wachkoo and Bharti, 2014

**Type locality:** India: Uttarakhand: Rajaji Forest Area

**Type depository:** HT, PT: PUAC; PT: BMNH, CASC

**Material examined:** **Uttarakhand:** Rajaji Forest Area, 25 (w.), 2 (q.), 6 (m.), 11.viii.2009, 7 (w.), 5.viii.2009, 55 (w.), 6.viii.2009, 30 (w.), 13.viii.2009, 62 (w.), 6.ix.2010, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Uttarakhand (Wachkoo and Bharti, 2014b: 275).

### *Pseudolasius polymorphicus* Wachkoo and Bharti, 2014

**Type locality:** India: Himachal Pradesh: Andretta

**Type depository:** HT, PT: PUAC; PT: BMNH, CASC

**Material examined:** Himachal Pradesh: Andretta, 46 (w.), 1 (q.), 6 (m.), 11.vi.2010, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Wachkoo and Bharti, 2014b: 276).

## Subfamily Leptanillinae

### *Leptanilla lamellata* Bharti and Kumar, 2012

**Type locality:** India: Himachal Pradesh: Kotla

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material examined:** **Himachal Pradesh:** Kotla, 11 (w.), 30.v.2009, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Kumar, 2012a: 620).

## Subfamily Myrmicinae

### *Cardiocondyla wroughtonii* (Forel, 1890)

*Emeryia wroughtonii* Forel, 1890

*Cardiocondyla wroughtonii* var. *hawaiiensis* Forel, 1899

*Cardiocondyla wroughtonii* subsp. *quadriceps* Forel, 1912

*Cardiocondyla wroughtoni* var. *bimaculata* Wheeler, 1929

*Cardiocondyla emeryi* subsp. *chlorotica* Menozzi, 1930

*Cardiocondyla longispina* Karavaiev, 1935

*Cardiocondyla yamauchii* Terayama, 1999

**Type locality:** India: Pune

**Type depository:** MHNG

**Material Examined: Himachal Pradesh:** Chanaur, 11 (w.), 20.x.2008; Dhaliara, 8 (w.), 09.vi.2009; Guga, 11 (w.), 06.x.2008; Jogi Panga, 3 (w.), 09.x.2008; Khatiar, 11 (w.), 11.x.2009; Kotla, 21 (w.), 1 (q.), 13.x.2008; Paonta Sahib, 1 (w.), 19.viii.2009, 5 (w.), 01.vi.2010; Terrace, 5 (w.), 1 (m.), 11.x.2008, 7 (w.), 3 (q.), 24.v.2009, 3 (w.), 07.x.2009. **Jammu and Kashmir:** Billawar, 12 (w.), 06.viii.2010. **Uttarakhand:** Forest Research Institute, 1 (w.), 17.viii.2009, 2 (w.), 30.vii.2009, 3 (w.), 20.v.2010; Rajaji Forest Area, 3 (w.), 05.viii.2009; Selaqui, 7 (w.), 3 (q.), 10.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 86).

### ***Carebara affinis* (Jerdon, 1851)**

*Oecodoma affinis* Jerdon, 1851

*Atta bellicosa* Smith, F., 1858

*Solenopsis laboriosa* Smith, F., 1861

*Solenopsis calida* Smith, F., 1863

*Pheidologeton affinis* var. *australis* Forel, 1915

*Pheidologeton australis* var. *mjobergi* Forel, 1918

**Type locality:** India: Kerala: Malabar

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Bari, 9 (w.), 15.x.2008; Ghatti, 2 (w.), 12.x.2008, 6 (w.), 27.ix.2009; Guraldhar, 38 (w.), 16.x.2008; Kandwal, 6 (w.), 23.vii.2010; Kotla, 28 (w.), 13.x.2008, 20 (w.), 30.v.2009; Paonta Sahib, 32 (w.), 09.v.2009; Renuka, 34 (w.), 26.viii.2009; Terrace, 21 (w.), 4.x.2008, 160 (w.), 11.x.2008, 46 (w.), 23.v.2009, 44 (w.), 21.x.2008, 14 (w.), 25.ix.2009. **Jammu and Kashmir:** Mansar, 15 (w.), 13.vii.2009; Surinsar, 2 (w.), 01.viii.2010. **Uttarakhand:** Forest Research Institute, 734 (w.), 30.ix.2008, 212 (w.), 01.x.2008, 2 (w.), 14.viii.2009; Rajaji Forest Area, 13 (w.), 5.viii.2009, 1 (w.), 11.viii.2009, 4 (w.), 06.ix.2010; Selaqui, 32 (w.), 02.x.2008, 60 (w.), 03.x.2008, 4 (w.), 07.viii.2009, 29 (w.), 08.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Punjab and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88).

### ***Carebara carinata* Bharti and Kumar, 2013**

**Type locality:** India: Himachal Pradesh: Ghatti

**Type depository:** HT, PT: PUAC

**Material examined: Himachal Pradesh:** Ghatti, 3 (w.), 27.ix.2009, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Kumar, 2013a: 49).

### ***Carebara dentata* Bharti and Kumar, 2013**

**Type locality:** India: Himachal Pradesh: Andretta, Kotla, Mandi, Terrace; Jammu and Kashmir: Kathua, Surinsar; Punjab: Thein Dam; Uttarakhand: Forest Research Institute, Rajaji Forest Area

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material examined: Himachal Pradesh:** Andretta, 6 (w.), 12.vi.2010; Kotla, 1 (w.), 13.vii.2010; Mandi, 6 (w.), 27.vi.2010; Terrace, 2 (w.), 17.vii.2010. **Jammu and Kashmir:** Kathua, 3 (w.), 25.vii.2010; Surinsar, 3 (w.), 14.vii.2009. **Punjab:** Thein Dam, 1 (w.), 20.vi.2009. **Uttarakhand:** Forest Research Institute, 4 (w.), 31.vii.2009; 7 (w.), 04.viii.2009; Rajaji Forest Area, 4 (w.), 11.viii.2009, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand (Bharti and Kumar, 2013a: 50).

### ***Carebara diversa* (Jerdon, 1851)**

*Oecodoma diversa* Jerdon, 1851

*Pheidole ocellifera* Smith, F., 1858

*Myrmica polita* Smith, F., 1860

*Pheidole megacephala* Smith, F., 1860

*Pheidole militaris* Smith, F., 1860

*Pheidole pabulator* Smith, F., 1860

*Pheidole megacephalotes* Dalla Torre, 1892

**Type locality:** India: Kerala: Wynaad

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Terrace, 5 (w.), 25.v.2009. **Uttarakhand:** Dakpathar, 2 (w.), 20.viii.2009; Forest Research Institute, 7 (w.), 19.v.2010; Rajaji Forest Area, 2 (w.), 5.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### ***Carebara hornata* Bharti and Kumar, 2013**

**Type locality:** India: Himachal Pradesh: Andretta

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material examined: Himachal Pradesh:** Andretta, 23 (w.), 11.vi.2010, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Kumar, 2013a: 52).

### ***Carebara propomegata* Bharti and Kumar, 2013**

**Type locality:** India: Himachal Pradesh: Paonta Sahib, Suketi;

Jammu and Kashmir: Manda

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material examined: Himachal Pradesh:** Paonta Sahib, 4 (w.), 19.viii.2009; Suketi, 1 (w.), 25.viii.2009. **Jammu and Kashmir:** Manda, 11 (w.), 4.viii.2010, 5 (w.), 15.vii.2009, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (Bharti and Kumar, 2013a: 55).

### ***Carebara rectangulata* Bharti and Kumar, 2013**

**Type locality:** India: Jammu and Kashmir: Billawar, Surinsar

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material examined: Jammu and Kashmir:** Billawar, 11 (w.), 6.viii.2010; Surinsar, 2 (w.), 01.viii.2010, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti and Kumar, 2013a: 56).

### ***Carebara spinata* Bharti and Kumar, 2013**

**Type locality:** India: Himachal Pradesh: Ghatti, Lwasa; Jammu and Kashmir: Sukrala; Uttarakhand: Dakpathar, Rajaji Forest Area

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material examined: Himachal Pradesh:** Ghatti, 1 (w.), 28.ix.2009; Lwasa, 10 (w.), 27.viii.2009. **Jammu and Kashmir:** Sukrala, 1 (w.), 7.viii.2010. **Uttarakhand:** Dakpathar, 31 (w.), 20.viii.2009; Rajaji Forest Area, 6 (w.), 11.viii.2009, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (Bharti and Kumar, 2013a: 59).

### ***Cataulacus latus* Forel, 1891**

**Type locality:** India: Maharashtra: Pune

**Type depository:** ST: MHNG

**Material Examined: Uttarakhand:** Forest research Institute, 7 (w.), 12.v.2009, 28 (w.), 13.v.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

### ***Cataulacus taprobanae* Smith, F., 1853**

**Type locality:** Sri Lanka

**Type depository:** HT: BMNH

**Material Examined: Himachal Pradesh:** Andretta, 2 (w.), 11.vi.2010, 10 (w.), 15.vi.2010; Baijnath, 10 (w.), 17.vi.2010;



## Ants in Northwestern Shivalik

Ghatti, 4 (w.), 12.x.2008, 4 (w.), 28.ix.2009; Nagabari, 5 (w.), 18.vi.2009; Nahan, 11 (w.), 06.v.2009; Terrace, 1 (w.), 13.vi.2009, 1 (w.), 12.x.2009. **Jammu and Kashmir:** Surinsar, 7 (w.), 01.viii.2010. **Uttarakhand:** Assan Barrage, 1 (w.), 10.v.2009; Forest Research Institute, 2 (w.), 12.v.2009, 5 (w.), 17.viii.2009, 3(w.), 20.v.2010; Rajaji Forest Area, 1 (w.), 05.viii.2009; Ranger's College, 4 (w.), 24.v.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (new record).

### *Crematogaster anthracina* Smith, F., 1857

**Type locality:** Singapore

**Type depository:** ST: OUMNH

**Material Examined: Himachal Pradesh:** Chanaur, 3 (w.), 20.x.2008; Dattal, 2 (w.), 16.vi.2010; Ghatti, 5 (w.), 17.x.2008; Kandwal, 12 (w.), 25.vi.2009; Khatiar, 49 (w.), 18.x.2008, 12 (w.), 03.vi.2009; Paonta Sahib, 23 (w.), 3 (q.), 48 (m.), 19.viii.2009; Suketi, 1 (w.), 25.viii.2009; Terrace, 1 (w.), 11.x.2008, 25 (w.), 23.x.2008, 24 (w.), 25.v.2009; Una, 30 (w.), 05.x.2008. **Jammu and Kashmir:** Manda, 25 (w.), 04.viii.2010; Surinsar, 6 (w.), 01.viii.2010. **Punjab:** Chohal, 24 (w.), 08.x.2008. **Uttarakhand:** Assan Barrage, 39 (w.), 10.v.2009, 20 (w.), 02.vi.2010; Rajaji Forest Area, 5 (w.), 11.viii.2009; Selaqui, 8 (w.), 08.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2013a: 86).

### *Crematogaster binghamii* Forel, 1904

**Type locality:** India: Sikkim

**Type depository:** LT: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 10 (w.), 13.vi.2010, 2 (w.), 20.vi.2010; Chanaur, 2 (w.), 20.x.2008; Guraldhar, 20 (w.), 04.x.2009; Kandwal, 7 (w.), 23.vii.2010; Khatiar, 3 (w.), 18.x.2008; Kotla, 37 (w.), 13.x.2008, 14 (w.), 22.x.2008, 1 (w.), 29.ix.2009, 8 (w.), 30.ix.2009, 4 (w.), 14.vii.2010; Lwasa, 13 (w.), 27.viii.2009; Paonta Sahib, 1 (w.), 19.viii.2009, 3 (w.), 01.vi.2010; Terrace, 49 (w.), 11.x.2008, 1 (w.), 24.ix.2009, 1 (w.), 25.ix.2009. **Jammu and Kashmir:** Billawar, 5 (w.), 06.viii.2010. **Uttarakhand:** Forest Research Institute, 35 (w.), 30.ix.2008, 7 (w.), 01.x.2008, 5 (w.), 12.viii.2009, 6 (w.), 17.viii.2009, 7 (w.), 30.vii.2009, 2 (w.), 04.ix.2010; Selaqui, 1 (w.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (new record), Uttarakhand (Blaimer, 2012).

### *Crematogaster biroi smythiesii* Forel, 1902

**Type locality:** India: Uttarakhand: Dehradun, Nagsidh Forests

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Jogi Panga, 4 (w.), 09.x.2008; Khatiar, 20 (w.), 11.x.2009; Kotla, 2 (w.), 30.ix.2009, 2 (w.), 14.vii.2010; Siholi, 6 (w.), 14.x.2009; Terrace, 14 (w.), 11.x.2008, 6 (w.), 25.ix.2009. **Jammu and Kashmir:** Surinsar, 2 (w.), 14.vii.2009. **Uttarakhand:** Forest Research Institute, 14 (w.), 01.x.2008, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (new record), Uttarakhand (Forel, 1902b: 204, 1903: 684; Chapman and Capco, 1951: 97; Hosoiishi and Ogata, 2009: 64).

### *Crematogaster flava* Forel, 1886

**Type locality:** India: Assam: Sibsagar

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 5 (w.), 15.vi.2010, 5 (w.), 20.vi.2010; Baijnath, 3 (w.), 17.vi.2010; Khajjiyan, 3 (w.), 19.vi.2009; Paonta Sahib, 27 (w.), 09.v.2009. **Uttarakhand:** Assan Barrage, 9 (w.), 10.v.2009; Forest Research Institute, 10 (w.), 11.v.2009, 20 (w.), 12.v.2009, 8 (w.), 13.v.2009,

12 (w.), 12.viii.2009, 9 (w.), 20.v.2010; Selaqui, 13 (w.), 09.viii.2009, 6 (w.), 29.v.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Blaimer, 2012), Jammu and Kashmir (Bharti *et al.*, 2013a: 86), Uttarakhand (new record).

### *Crematogaster rothneyi* Mayr, 1879

*Crematogaster rothneyi* Smith, F., 1873

**Type locality:** India: West Bengal: Kolkata

**Type depository:** ST: NHMW

**Material Examined: Himachal Pradesh:** Andretta, 6 (w.), 11.vi.2010; Bari, 9 (w.), 01.x.2009; Chanaur, 15 (w.), 20.x.2008, 15 (w.), 05.vi.2009, 20 (w.), 03.x.2009; Dehra, 5 (w.), 06.vii.2010; Guga, 4 (w.), 06.x.2008; Guraldhar, 4 (w.), 16.x.2008; Nahan, 22 (w.), 23.viii.2009; Rehan, 8 (w.), 08.vii.2010; Siholi, 5 (w.), 19.x.2008; Terrace, 4 (w.), 19.x.2008, 12 (w.), 26.v.2009, 16 (w.), 02.x.2009, 24 (w.), 14.x.2009. **Jammu and Kashmir:** Udhampur, 7 (w.), 04.vii.2009. **Punjab:** Dharampur, 7 (w.), 14.x.2008; Thein Dam, 1 (w.), 20.vi.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (new record), Uttarakhand (Forel, 1903: 682, 1906: 89).

### *Crematogaster sagei* Forel, 1902

**Type locality:** India: Himachal Pradesh: Dharamsala;

Uttarakhand: Dehradun

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Dattal, 6 (w.), 16.vi.2010; Kotla, 5 (w.), 15.x.2010; Terrace, 2 (w.), 23.x.2008. **Jammu and Kashmir:** Billawar, 5 (w.), 06.viii.2010. **Uttarakhand:** Forest Research Institute, 2 (w.), 30.ix.2008, 2 (w.), 19.v.2010; Selaqui, 6 (w.), 05.ix.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1902b: 205; Blaimer, 2012), Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 86), Uttarakhand (Forel, 1902b: 205).

### *Crematogaster subnuda* Mayr, 1879

**Type locality:** India: West Bengal: Kolkata

**Type depository:** ST: NHMW

**Material Examined: Himachal Pradesh:** Bari, 48 (w.), 15.x.2008; Chanaur, 14 (w.), 12.vi.2009, 25 (w.), 20.x.2008; Dhaliara, 12 (w.), 09.vi.2009; Ghatti, 22 (w.), 12.x.2008, 17 (w.), 17.x.2008, 29 (w.), 27.ix.2009; Guga, 24 (w.), 06.x.2008; Guraldhar, 25 (w.), 04.x.2009; Jogi Panga, 14 (w.), 09.x.2008; Jol, 9 (w.), 06.x.2009; Khatiar, 39 (w.), 18.x.2008, 10 (w.), 11.x.2009; Kotla, 38 (w.), 13.x.2008, 13 (w.), 15.x.2009; Nahan, 17 (w.), 23.viii.2009, 10 (w.), 4.vi.2010; Paonta Sahib, 26 (w.), 19.viii.2009; Renuka, 12 (w.), 08.v.2009; Siholi, 3 (w.), 02.x.2009; Terrace, 31 (w.), 11.x.2008, 10 (w.), 21.x.2008, 38 (w.), 25.ix.2009, 23 (w.), 10.vii.2010. **Jammu and Kashmir:** Kathua, 16 (w.), 30.vii.2010; Manda, 27 (w.), 15.vii.2009. **Punjab:** Chohal, 37 (w.), 08.x.2008; Jugial, 9 (w.), 24.vi.2009; Thein Dam, 14 (w.), 17.vi.2009. **Uttarakhand:** Forest Research Institute, 12 (w.), 30.ix.2008, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti, 2008: 84), Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 86), Punjab (Imai *et al.*, 1984: 6; Tak and Rathore, 2004: 175; Bharti, 2008: 84; Bharti *et al.*, 2009: 38; Tak and Kazmi, 2011: 42), Uttarakhand (Bharti, 2008: 84; Blaimer, 2012).

### *Dilobocondyla gasteroreticulata* Bharti and Kumar, 2013

*Dilobocondyla gasteroreticulatus* Bharti and Kumar, 2013

**Type locality:** India: Himachal Pradesh: Baijnath; Uttarakhand: Forest Research Institute

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material Examined: Himachal Pradesh:** Baijnath, 4 (w.), 17.vi.2010. **Uttarakhand:** Forest Research Institute, 1 (w.), 19.v.2010, 8 (w.), 1 (q.), 26.v.2010, leg. R. Kumar and H. Bharti (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bharti and Kumar, 2013b: 34).

### ***Erromyrmex latinodis* (Mayr, 1872)**

*Monomorium latinode* Mayr, 1872

*Momonorium latinode* var. *bruneum* Emery, 1893

*Monomorium voeltzkowi* Forel, 1907

**Type locality:** Malaysia: Sarawak: Borneo

**Type depository:** LT: BMNH; PLT: MSNG

**Material Examined: Uttarakhand:** Rajaji Forest Area, 2 (w.), 06.ix.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

### ***Gauromyrmex acanthinus* (Karavaiev, 1935)**

*Solenomyrma acanthina* Karavaiev, 1935

*Acalama donisthorpei* Smith, M.R., 1949

**Type locality:** Vietnam

**Type depository:** ST: Unknown

**Material Examined: Himachal Pradesh:** Andretta, 7 (w.), 20.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

### ***Lophomyrmex ambiguus* Rigato, 1994**

**Type locality:** India: Northeast region; Uttarakhand: Dehradun; Kumaon District, Kathgodam

**Type depository:** HT: ANIC; PT: ANIC, BMNH, MCZC

**Material Examined: Uttarakhand:** Forest Research Institute, 6 (w.), 30.vii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2013a: 86), Uttarakhand (Rigato, 1994: 54).

### ***Lophomyrmex bedoti* Emery, 1893**

**Type locality:** Indonesia: Sumatra: Deli

**Type depository:** ST: MSNG

**Material Examined: Himachal Pradesh:** Lwasa, 3 (w.), 27.viii.2009; Renuka, 32 (w.), 26.viii.2009; Terrace, 5 (w.), 24.ix.2009; Una, 4 (w.), 05.x.2008. **Uttarakhand:** Dakpathar, 6 (w.), 20.viii.2009; Forest Research Institute, 352 (w.), 30.ix.2008, 409 (w.), 01.x.2008, 61 (w.), 03.x.2008, 65 (w.), 30.vii.2009, 4 (w.), 01.viii.2009, 3 (w.), 02.viii.2009, 4 (w.), 03.viii.2009, 41 (w.), 04.viii.2009, 5 (w.), 12.viii.2009, 15 (w.), 17.viii.2009, 13 (w.), 26.v.2010; Rajaji Forest Area, 9 (w.), 05.viii.2009, 3 (w.), 06.viii.2009, 27 (w.), 11.viii.2009, 11 (w.), 07.ix.2010; Ranger's College, 19 (w.), 24.v.2010; Selaqui, 309 (w.), 02.ix.2008, 43 (w.), 09.viii.2009, 19 (w.), 05.ix.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 86), Uttarakhand (Forel, 1903: 695; Imai *et al.*, 1984: 7).

### ***Lophomyrmex quadrispinosus* (Jerdon, 1851)**

*Oecodoma quadrispinosa* Jerdon, 1851

*Lophomyrmex quadrispinosus* var. *taprobanae* Forel, 1911

**Type locality:** India: Kerala: Malabar

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Chanaur, 1 (w.), 03.x.2009; Kotla, 16 (w.), 29.ix.2009, 89 (w.), 22.x.2008; Nahan, 1 (w.), 23.viii.2009; Paonta Sahib, 6 (w.), 09.v.2009, 10 (w.), 19.viii.2009, 20 (w.), 01.vi.2010; Terrace, 1 (w.), 24.ix.2009. **Uttarakhand:** Forest Research Institute, 3 (w.), 20.v.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 86), Uttarakhand (Forel, 1906: 88).

### ***Lophomyrmex terraceensis* Bharti and Kumar, 2012**

**Type locality:** India: Himachal Pradesh: Terrace

**Type depository:** HT, PT: PUAC

**Material Examined: Himachal Pradesh:** Terrace, 2 (w.), 25.v.2009, leg. R. Kumar and H. Bharti (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Kumar, 2012b: 266).

### ***Mayriella transfuga* Baroni Urbani, 1977**

**Type locality:** Nepal: NW Narainghat

**Type depository:** HT, PT: NHMB; PT, BMNH

**Material Examined: Himachal Pradesh:** Ghatti, 10 (w.), 12.x.2008, 15 (w.), 27.ix.2009, 8 (w.), 13.x.2009, 21 (w.), 27.ix.2009; Nagabari, 1 (w.), 18.vi.2009; Paonta Sahib, 11 (w.), 19.viii.2009; Rehan, 5 (w.), 08.vii.2010; Terrace, 5 (w.), 07.x.2009. **Uttarakhand:** Forest Research Institute, 1 (w.), 17.viii.2009, 2 (w.), 04.ix.2010; Rajaji Forest Area, 6 (w.), 11.viii.2009; Selaqui, 1 (w.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 86), Uttarakhand (Shattuck and Barnett, 2007: 449).

### ***Meranoplus bicolor* (Guerin-Meneville, 1844)**

*Cryptocerus bicolor* Guérin-Méneville, 1844

*Myrmica tarda* Jerdon, 1851

*Meranoplus dimicans* Walker, 1859

*Meranoplus villosus* Motschoulsky, 1860

*Meranoplus bicolor* var. *lucida* Forel, 1903

*Meranoplus bicolor* var. *fuscescens* Wheeler, 1930

**Type locality:** India: Tamil Nadu: Pudicherry

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Andretta, 14 (w.), 11.vi.2010; Baijnath, 4 (w.), 17.vi.2010; Bilaspur, 5 (w.), 02.vii.2010; Chanaur, 4 (w.), 20.x.2008; Dattal, 6 (w.), 16.vi.2010; Ghatti, 10 (w.), 12.x.2008; Kandwal, 21 (w.), 23.vii.2010; Khajjiyan, 1 (w.), 19.vi.2009; Kotla, 3 (w.), 13.x.2008, 3 (w.), 22.x.2008, 22 (w.), 30.ix.2009; Paonta Sahib, 10 (w.), 01.vii.2010; Rehan, 5 (w.), 08.vii.2010; Terrace, 7 (w.), 21.x.2008, 10 (w.), 12.x.2009, 3 (w.), 24.v.2009; Una, 258 (w.), 05.x.2008. **Jammu and Kashmir:** Billawar, 5 (w.), 06.viii.2010; Kathua, 8 (w.), 25.vii.2010, 2 (w.), 30.vii.2010; Mansar, 5 (w.), 31.vii.2010; Sukrala, 3 (w.), 7.viii.2010; Udampur, 6 (w.), 04.vii.2009. **Punjab:** Dharampur, 3 (w.), 14.x.2008. **Uttarakhand:** Forest Research Institute, 11 (w.), 30.vii.200, 96 (w.), 17.viii.2009, 6 (w.), 26.v.2010; Selaqui, 60 (w.), 08.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 86), Punjab (Imai *et al.*, 1984: 6; Schödl, 1998: 371; Tak and Rathore, 2004: 176; Bharti *et al.*, 2009: 38; Tak, 2009: 17), Uttarakhand (Schödl, 1998: 371).

### ***Messor himalayanus* (Forel, 1902)**

*Stenamma barbarum* r. *himalayanum* Forel, 1902

**Type locality:** India: Jammu and Kashmir: Rajauri, Panjah; Himachal Pradesh: Dharamsala; Uttarakhand: Garhwal, Tons Valley; Mussorrie

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 6 (w.), 13.vi.2010; Bajaura, 19 (w.), 23.vi.2010; Bilaspur, 1 (w.), 01.vii.2010; Guraldhar, 1 (w.), 16.x.2008, 11 (w.), 04.x.2009; Lwasa, 13 (w.), 27.viii.2009; Mandi, 1 (w.), 27.vi.2010; Rewalsar, 2 (w.), 29.vi.2010. **Punjab:** Dunera, 4 (w.), 23.vi.2009, leg. R. Kumar.



## Ants in Northwestern Shivalik

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1902b: 220, 1903: 695, 1906: 86), Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 86), Punjab (Tak, 2009: 27), Uttarakhand (Forel, 1902b: 220, 1903: 695).

### *Messor instabilis* (Smith, F., 1858)

*Atta instabilis* Smith, F., 1858

*Aphaenogaster barbara* var. *punctata* Forel, 1886

**Type locality:** India: Northwestern region

**Type depository:** ST: BMNH

**Material Examined: Himachal Pradesh:** Bakhra, 4 (w.), 07.x.2008; Bari, 64 (w.), 15.x.2008, 11 (w.), 01.x.2009; Chanaur, 13 (w.), 20.x.2008; Ghatti, 51 (w.), 17.x.2008; Guga, 15 (w.), 06.x.2008; Guraldhar, 22 (w.), 16.x.2008, 20 (w.), 04.x.2009; Jogi Panga, 34 (w.), 09.x.2008; Khatiar, 7 (w.), 11.x.2009; Kotla, 7 (w.), 22.x.2008; Siholi, 7 (w.), 17.vii.2010; Terrace, 32 (w.), 23.x.2008, 10 (w.), 10.vii.2010. **Punjab:** Chohal, 4 (w.), 08.x.2008; Dharampur, 14 (w.), 14.x.2008, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 86), Punjab (Bharti *et al.*, 2009: 38), Uttarakhand (Forel, 1903: 694).

### *Monomorium floricola* (Jerdon, 1851)

*Atta floricola* Jerdon, 1851

*Monomorium cinnabari* Roger, 1863

*Monomorium poecilum* Roger, 1863

*Monomorium specularis* Mayr, 1866

*Monomorium impressum* Smith, F., 1876

*Monomorium floricola* var. *philippinensis* Forel, 1910

*Monomorium floricola* var. *furina* Forel, 1911

*Monomorium floreanum* Stitz, 1932

*Monomorium angusticlava* Donisthorpe, 1947

**Type locality:** India: Kerala: Malabar, Thalassery

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Nagabari, 8 (w.), 18.vi.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 87).

### *Monomorium indicum* Forel, 1902

*Monomorium salomonis* r. *indicum* Forel, 1902

**Type locality:** India: Tamil Nadu: Tiruchirappalli

**Type depository:** ST: HNHM

**Material Examined: Himachal Pradesh:** Ghatti, 30 (w.), 12.x.2008; Khatiar, 20 (w.), 11.x.2009; Khushinagar, 16 (w.), 17.vi.2009; Nahan, 35 (w.), 23.viii.2009; Suketi, 46 (w.), 1 (q.), 25.viii.2009; Terrace, 12 (w.), 11.x.2008, 39 (w.), 24.v.2009, 4 (w.), 17.vii.2010; Una, 34 (w.), 05.x.2008. **Jammu and Kashmir:** Mansar, 31 (w.), 31.vii.2010; Manda, 24 (w.), 05.vii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2013a: 87), Punjab (Imai *et al.*, 1984: 7; Bharti *et al.*, 2009: 38; Tak and Rathore, 2004: 177; Tak, 2009: 25, 2010: 138; Tak and Kazmi, 2011: 44).

### *Monomorium monomorium* Bolton, 1987

*Monomorium minutum* Mayr, 1855

**Type locality:** Italy: Lido

**Type depository:** ST: BMNH

**Material Examined: Uttarakhand:** Assan Barrage, 3 (w.), 21.viii.2009; Rajaji Forest Area, 2 (w.), 10.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

### *Monomorium orientale* Mayr, 1879

**Type locality:** India: West Bengal: Kolkata

**Type depository:** HT: NHMW

**Material Examined: Himachal Pradesh:** Andretta, 15 (w.), 11.vi.2010; Baijnath, 6 (w.), 17.vi.2010; Chanaur, 3 (w.), 12.vi.2009; Ghatti, 1 (w.), 27.ix.2009, 2 (w.), 12.x.2008; Guga, 8 (w.), 06.x.2008; Guraldhar, 3 (w.), 04.x.2009; Jogi Panga, 1 (w.), 09.x.2008; Khatiar, 7 (w.), 18.x.2008; Kotla, 13 (w.), 30.ix.2009; Lwasa, 2 (w.), 27.viii.2009; Nahan, 6 (w.), 23.viii.2009; Siholi, 1 (w.), 04.vi.2009; Terrace, 14 (w.), 11.x.2008; Una, 6 (w.), 05.x.2008. **Jammu and Kashmir:** Manda, 2 (w.), 15.vii.2009; Sukrala, 8 (w.), 07.viii.2010; Surinsar, 5 (w.), 01.viii.2010. **Uttarakhand:** Rajaji Forest Area, 3 (w.), 11.viii.2009, 20 (w.), 05.viii.2009, 13 (w.), 06.viii.2009, 1 (w.), 10.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 87), Punjab (Imai *et al.*, 1984: 7).

### *Monomorium pharaonis* (Linnaeus, 1758)

*Formica pharaonis* Linnaeus, 1758

*Formica antiguensis* Fabricius, 1793

*Myrmica domestica* Shuckard, 1838

*Atta minuta* Jerdon, 1851

*Myrmica vastator* Smith, F., 1857

*Myrmica contigua* Smith, F., 1858

*Myrmica fragilis* Smith, F., 1858

**Type locality:** Egypt

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Bari, 31 (w.), 15.x.2008; Chanaur, 44 (w.), 20.x.2008; Guga, 8 (w.), 06.x.2008; Guraldhar, 67 (w.), 16.x.2008, 20 (w.), 02.vi.2009; Jogi Panga, 14 (w.), 09.x.2008; Khatiar, 3 (w.), 18.x.2008; Khushinagar, 6 (w.), 17.vi.2009; Kotla, 5 (w.), 13.x.2008, 4 (w.), 22.x.2008; Renuka, 2 (w.), 08.v.2009; Siholi, 6 (w.), 19.x.2008. **Jammu and Kashmir:** Samba, 1 (w.), 11.vii.2009. **Punjab:** Chohal, 4 (w.), 08.x.2008; Dunera, 14 (w.), 21.vi.2009. **Uttarakhand:** Assan Barrage, 2 (w.), 02.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 87), Punjab (Bharti *et al.*, 2009: 38).

### *Monomorium sagei* Forel, 1902

**Type locality:** India: Himachal Pradesh: Dharamsala

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 15 (w.), 12.vi.2010; Chanaur, 2 (w.), 20.x.2008, 10 (w.), 05.vi.2009; Siholi, 3 (w.), 19.x.2008; Dattal, 12 (w.), 16.vi.2010; Ghatti, 10 (w.), 12.x.2008; Terrace, 11 (w.), 11.x.2008, 8 (w.), 24.ix.2009, 8 (w.), 20.vii.2010. **Jammu and Kashmir:** Kathua, 15 (w.), 25.vii.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1902b: 211, 1903: 688, 1906: 88; Mukherji and Ribeiro, 1925: 207; Pisarski, 1967: 395), Jammu and Kashmir (Bharti *et al.*, 2013a: 87).

### *Myrmicaria brunnea* Saunders, 1842

**Type locality:** India: Northwestern Provinces

**Type depository:** HT: Unknown

**Material Examined: Himachal Pradesh:** Bakhra, 39 (w.), 07.x.2008; Bari, 7 (w.), 01.x.2009; Bilaspur, 1 (w.), 01.vii.2010; Ghatti, 3 (w.), 17.x.2008, 10 (w.), 27.ix.2009, 8 (w.), 11.vii.2010; Jogi Panga, 12 (w.), 09.x.2008; Kotla, 2 (w.), 15.x.2009, 10 (w.), 13.vii.2010; Nahan, 14 (w.), 23.viii.2009; Renuka, 2 (w.), 26.viii.2009; Siholi, 4 (w.), 17.vii.2010; Terrace, 2 (w.), 25.v.2009, 3 (w.), 12.x.2009. **Jammu and Kashmir:** Billawar, 8 (w.), 6.viii.2010; Kathua, 5 (w.), 29.vii.2010; Manda, 3 (w.), 04.viii.2010, 7 (w.), 15.vii.2009; Samba, 7 (w.), 11.vii.2009; Surinsar, 6 (w.), 14.vii.2009, 7 (w.), 01.viii.2010; Udampur, 12 (w.), 04.vii.2009. **Punjab:** Chohal, 43 (w.), 08.x.2008; Thein Dam,

10 (w.), 20.vi.2009; 7 (w.), 17.vi.2009. **Uttarakhand:** Assan Barrage, 5 (w.), 21.viii.2009, leg., R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88), Punjab (Bharti *et al.*, 2009: 39).

### ***Pheidole indica* Mayr, 1879**

*Pheidole striativentris* Mayr, 1879

*Pheidole indica* r. *himalayana* Forel, 1902

*Pheidole indica* r. *rotschana* Forel, 1902

*Pheidole javana* r. *jubilans* var. *formosae* Forel, 1912

**Type locality:** India: West Bengal: Kolkata

**Type depository:** LT, PLT: NHMW

**Material Examined: Himachal Pradesh:** Terrace, 8 (w.), 12.x.2009; Una, 10 (w.), 05.x.2008. **Punjab:** Chohal, 5 (w.), 08.x.2008. **Uttarakhand:** Ranger's College, 5 (w.), 2.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1902b: 198, 1902c: 546, 1906: 89; Eguchi, 2004: 198), Jammu and Kashmir (Bharti and Sharma, 2009: 13; Bharti *et al.*, 2013a: 88), Punjab (Imai *et al.*, 1984: 6; Bharti *et al.*, 2009: 38; Bharti and Gill, 2011: 39), Uttarakhand (new record).

### ***Pheidole jucunda fossulata* Forel, 1902**

**Type locality:** India: Maharashtra: Pune

**Type depository:** ST: MHNG, MSNG

**Material Examined: Himachal Pradesh:** Ghatti, 2 (w.), 28.ix.2009; Kandwal, 10 (w.), 25.vi.2009; Renuka, 4 (w.), 26.viii.2009. **Uttarakhand:** Rajaji Forest Area, 28 (w.), 1 (q.), 11.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88).

### ***Pheidole latinoda major* Forel, 1885**

**Type locality:** India

**Type depository:** ST: NHMW

**Material Examined: Himachal Pradesh:** Andretta, 11 (w.), 11.vi.2010, 35 (w.), 15.vi.2010, 3 (w.), 19.vi.2010; Bakhra, 54 (w.), 07.x.2008; Bari, 45 (w.), 15.x.2008; Chanaur, 32 (w.), 12.vi.2009, 32 (w.), 20.x.2008; Ghatti, 93 (w.), 12.x.2008, 25 (w.), 17.x.2008, 27 (w.), 11.vii.2010; Guga, 261 (w.), 06.x.2008; Guraldhar, 183 (w.), 16.x.2008; Jogi Panga, 794 (w.), 09.x.2008; Khatiar, 30 (w.), 18.x.2008; Kotla, 240 (w.), 13.x.2008, 168 (w.), 15.x.2009, 15 (w.), 28.v.2009, 32 (w.), 30.v.2009, 27 (w.), 13.vii.2010; Nagabari, 36 (w.), 18.vi.2009; Paonta Sahib, 13 (w.), 01.vi.2010; Pong Dam, 29 (w.), 17.x.2008; Siholi, 25 (w.), 19.x.2008; Terrace, 50 (w.), 01.x.2008, 736 (w.), 11.x.2008, 241 (w.), 21.x.2008, 26 (w.), 25.v.2009; Una, 263 (w.), 05.x.2008. **Jammu and Kashmir:** Mansar, 5 (w.), 13.vii.2009; Surinsar, 60 (w.), 14.vii.2009; Udampur, 11 (w.), 04.vii.2009. **Punjab:** Chohal, 487 (w.), 08.x.2008; Dharampur, 24 (w.), 14.x.2008; Thein Dam, 15 (w.), 26.vi.2009; Dunera, 25 (w.), 23.vi.2009. **Uttarakhand:** Assan Barrage, 17 (w.), 21.viii.2009; Forest Research Institute, 107 (w.), 12.v.2009, 13 (w.), 13.v.2009, 35 (w.), 17.viii.2009; Ranger's College, 10 (w.), 24.v.2010; Selaqui, 2 (w.), 02.x.2008, leg., R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Punjab and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88).

### ***Pheidole parva* Mayr, 1865**

*Pheidole parva* var. *decanica* Forel, 1902

*Pheidole flavens* var. *farquharensis* Forel, 1907

*Pheidole sauteri* Wheeler, 1909

*Pheidole rinae* var. *mala* Forel, 1911

*Pheidole rinae* r. *tipuna* Forel, 1912

*Pheidole bugi* Wheeler, 1919

*Pheidole tardus* Donisthorpe, 1947

**Type locality:** Sri Lanka

**Type depository:** LT, PLT: NHMW

**Material Examined: Jammu and Kashmir:** Kathua, 20 (w.), 25.vii.2010. **Uttarakhand:** Rajaji Forest Area, 9 (w.), 2.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (new record), Uttarakhand (Eguchi *et al.*, 2007: 261; Eguchi, 2008: 66).

### ***Pheidole pronotalis* Forel, 1902**

**Type locality:** Sri Lanka

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 1 (w.), 15.vi.2010; Palampur, 3 (w.), 14.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

### ***Pheidole sagei* Forel, 1902**

**Type locality:** India: Himachal Pradesh: Dharamsala

**Type depository:** ST: MHNG, MSNG

**Material Examined: Himachal Pradesh:** Terrace, 5 (w.), 24.v.2009; Lwasa, 5 (w.), 27.viii.2009. **Uttarakhand:** Forest Research Institute, 6 (w.), 13.v.2009; Rajaji Forest Area, 5 (w.), 05.viii.2009, 10 (w.), 2 (m.), 06.viii.2009, 8 (w.), 10.viii.2009, 24 (w.), 1 (q.), 2 (m.), 11.viii.2009, 4 (w.), 13.viii.2009; Selaqui, 2 (w.), 2 (q.), 2 (m.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1902b: 192, 1902c: 542, 1906: 88; Matthew and Tiwari, 2000: 318), Uttarakhand (new record).

### ***Pheidole sharpi* Forel, 1902**

**Type locality:** India: Tamil Nadu: Salem

**Type depository:** ST: MHNG

**Material Examined: Uttarakhand:** Forest Research Institute, 18 (w.), 4 (q.), 17.viii.2009; Rajaji Forest Area, 38 (w.), 3 (q.), 05.viii.2009, 2 (w.), 10.viii.2009, 10(w.), 1(q.), 11.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2013a: 88), Uttarakhand (new record).

### ***Pheidole smythiesii* Forel, 1902**

*Pheidole smythiesii* var. *bengalensis* Forel, 1902

*Pheidole bhavanae* Bingham, 1903

**Type locality:** India: Assam

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 9 (w.), 11.vi.2010, 7 (w.), 2 (q.), 14 (m.); Baijnath, 4 (w.), 17.vi.2010; Bilaspur, 7 (w.), 01.vii.2010; Mandi, 3 (w.), 27.vi.2010; Rewalsar, 12 (w.), 6 (q.), 30.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Eguchi, 2008: 87), Jammu and Kashmir (Bharti *et al.*, 2013a: 88).

### ***Pheidole spathifera aspatha* Forel, 1902**

**Type locality:** India: Assam

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Dehra, 10 (w.), 1 (m.), 06.vii.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88).

### ***Pheidole woodmasoni* Forel, 1885**

**Type locality:** India: West Bengal: Kolkata; Odisha

Type depository: ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 4 (w.), 15.vi.2010; Baijnath, 14 (w.), 17.vi.2010; Terrace, 15 (w.), 23.x.2008, 6 (w.), 26.v.2009. **Jammu and Kashmir:** Manda, 2



## Ants in Northwestern Shivalik

(w.), 15.vii.2009, 4 (w.), 04.viii.2010; Surinsar, 5 (w.), 14.vii.2009; Udhampur, 14 (w.), 04.vii.2009. **Uttarakhand:** Forest Research Institute, 9 (w.), 04.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88), Punjab (Imai *et al.*, 1984: 6), Uttarakhand (Forel, 1902b: 191, 1902c: 541, 1906: 88).

### *Recurvidris recurvispinosa* (Forel, 1890)

*Trigonogaster recurvispinosus* Forel, 1890

**Type locality:** India: Maharashtra: Pune

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Chanaur, 6 (w.), 03.x.2009; Ghatti, 52 (w.), 27.ix.2009, 16 (w.), 28.ix.2009; Guraldhar, 2 (w.), 16.x.2008; Kotla, 1 (w.), 13.x.2008, 11 (w.), 30.ix.2009; Lwasa, 2 (w.), 27.viii.2009; Nagabari, 25 (w.), 18.vi.2009; Paonta Sahib, 8 (w.), 19.viii.2009, 3 (w.), 01.vi.2010; Rehan, 2 (w.), 08.vii.2010; Siholi, 35 (w.), 19.x.2008, 3 (w.), 02.x.2009; Terrace, 26 (w.), 11.x.2008, 1(w.), 24.ix.2009, 11 (w.), 25.ix.2009. **Jammu and Kashmir:** Billawar, 1 (w.), 06.viii.2010; Mansar, 7 (w.), 13.vii.2009; Manda, 2 (w.), 04.viii.2010. **Punjab:** Thein Dam, 3 (w.), 20.vi.2009. **Uttarakhand:** Forest Research Institute, 1 (w.), 17.viii.2009; Rajaji Forest Area, 8 (w.), 11.viii.2009, 5 (w.), 13.viii.2009; Selaqui, 5 (w.), 05.viii.2009, 1 (w.), 07.viii.2009, 1 (w.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Punjab (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88), Uttarakhand (Bolton, 1992: 46; Sheela *et al.*, 2000: 95).

### *Solenopsis geminata* (Fabricius, 1804)

*Atta geminata* Fabricius, 1804

*Myrmica paleata* Lund, 1831

*Solenopsis mandibularis* Westwood, 1840

*Atta rufa* Jerdon, 1851

*Atta clypeata* Smith, F., 1858

*Myrmica mellea* Smith, F., 1859

*Solenopsis cephalotes* Smith, F., 1859

*Crematogaster laboriosus* Smith, F., 1860

*Myrmica laevissima* Smith, F., 1860

*Diplorehoptrum drewseni* Mayr, 1861

*Myrmica glaber* Smith, F., 1862

*Myrmica polita* Smith, F., 1862

*Atta coloradensis* Buckley, 1866

*Atta lincecumii* Buckley, 1866

*Myrmica saxicola* Buckley, 1866

*Solenopsis geminata* var. *diabola* Wheeler, 1908

*Solenopsis geminata* var. *nigra* Forel, 1908

*Solenopsis eduardi* Forel, 1912

*Solenopsis geminata* var. *innota* Santschi, 1915

*Solenopsis geminata* subsp. *medusa* Mann, 1916

*Solenopsis geminata* var. *galapageia* Wheeler, 1919

*Solenopsis edouardi* var. *bahiaensis* Santschi, 1925

*Solenopsis edouardi* var. *perversa* Santschi, 1925

**Type locality:** Central America

**Type depository:** ST: ZMUC

**Material Examined: Himachal Pradesh:** Bajaura, 1100m, 4 (w.), 23.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti, 2001: 164).

### *Strumigenys exilirhina* Bolton, 2000

**Type locality:** Nepal: Sanghu

**Type depository:** HT: BMNH; PT: BMNH, MCZC, MHNG, OUMNH

**Material Examined: Uttarakhand:** Forest Research Institute, 2 (w.), 30.ix.2008, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

### *Strumigenys membranifera* Emery, 1869

*Strumigenys membranifera* r. *simillima* Emery, 1890

*Strumigenys membranifera* var. *santschii* Forel, 1904

*Strumigenys vitiensis* Mann, 1921

*Strumigenys foochowensis* Wheeler, 1928

*Strumigenys silvestriana* Wheeler, 1928

*Strumigenys membranifera* var. *marioni* Wheeler, 1933

*Strumigenys membranifera* var. *williamsi* Wheeler, 1933

**Type locality:** Italy: Napoli, Portici

**Type depository:** ST: MSNG

**Material Examined: Himachal Pradesh:** Andretta, 4 (w.), 15.vi.2010; Terrace, 1 (w.), 10.x.2008, 2 (w.), 11.x.2008. **Jammu and Kashmir:** Mansar, 1 (w.), 31.vii.2010. **Uttarakhand:** Dakpathar, 5 (w.), 20.viii.2009; Forest Research Institute, 3 (w.), 1 (q.), 04.ix.2010; Rajaji Forest Area, 2 (w.), 10.viii.2009, 7 (w.), 11.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (new record).

### *Strumigenys nepalensis* De Andrade, 1994

**Type locality:** Nepal: Narainghat; Manhari; India: Meghalaya: Darugiri

**Type depository:** HT: NHMB; PT: BMNH, NHMB

**Material Examined: Himachal Pradesh:** Andretta, 16 (w.), 2 (q.), 15.vi.2010; Nagabari, 1 (q.), 18.vi.2009; Siholi, 3 (w.), 19.x.2008; Terrace, 6 (w.), 11.x.2008. **Uttarakhand:** Rajaji Forest Area, 38 (w.), 1 (q.), 11.viii.2009; Selaqui, 10 (w.), 08.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### *Strumigenys virgila* Bolton, 2000

**Type locality:** India: Himachal Pradesh: Shivalik Hills, Nahan; Uttarakhand: Dehradun, Rajaji National Park

**Type depository:** HT: NHMW; PT: BMNH

**Material Examined: Himachal Pradesh:** Andretta, 60 (w.), 2 (m.), 15.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bolton, 2000: 832).

### *Tetramorium bicarinatum* (Nylander, 1846)

*Myrmica bicarinata* Nylander, 1846

*Myrmica cariniceps* Guérin-Méneville, 1852

*Myrmica kollari* Mayr, 1853

*Myrmica modesta* Smith, F. 1860

*Myrmica reticulata* Smith, F. 1862

**Type locality:** U.S.A.: California

**Type depository:** Lost

**Material Examined: Himachal Pradesh:** Andretta, 1 (w.), 20.vi.2010; Ghatti, 1 (w.), 27.ix.2009; Terrace, 3 (w.), 12.x.2009. **Uttarakhand:** Forest Research Institute, 3 (w.), 13.v.2009, 1 (w.), 17.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### *Tetramorium coonoorens* Forel, 1902

**Type locality:** India: Tamil Nadu: Coonoor

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Terrace, 1 (w.), 11.x.2008. **Uttarakhand:** Selaqui, 1 (w.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### *Tetramorium lanuginosum* Mayr, 1870

*Tetramorium obesum* r. *striatidens* Emery, 1889

*Triglyphothrix striatidens* var. *laevidens* Forel, 1900

*Triglyphothrix striatidens* var. *australis* Forel, 1902  
*Triglyphothrix striatidens* r. *orissana* Forel, 1902  
*Triglyphothrix ceramensis* Stitz, 1912  
*Triglyphothrix striatidens* var. *felix* Forel, 1912  
*Triglyphothrix striatidens* var. *flavescens* Wheeler, 1929  
*Triglyphothrix mauricei* Donisthorpe, 1946  
*Triglyphothrix tricolor* Donisthorpe, 1948

**Type locality:** Indonesia: Java: Batavia

**Type depository:** HT: NHMW

**Material Examined: Himachal Pradesh:** Bakhra, 5 (w.), 07.x.2008; Chanaur, 17 (w.), 20.x.2008; Dhaliara, 14 (w.), 09.vi.2009; Kotla, 1 (w.), 13.ix.2009; Nahan, 18 (w.), 06.v.2009, 2 (w.), 23.viii.2009; Renuka, 2 (w.), 25.viii.2009; Terrace, 12 (w.), 11.x.2008, 4 (w.), 11.vi.2009. **Jammu and Kashmir:** Mansar, 4 (w.), 13.vii.2009. **Uttarakhand:** Assan Barrage, 20 (w.), 02.vi.2010; Forest Research Institute, 10 (w.), 01.x.2008, 3 (w.), 20.v.2010; Selaqui, 5 (w.), 03.x.2008, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 88), Punjab (Imai *et al.*, 1984: 8).

### ***Tetramorium obesum* Andre, 1887**

**Type locality:** India: Tamil Nadu: Gingee

**Type depository:** ST: MCZC; MNHN

**Material Examined: Himachal Pradesh:** Bakhra, 1 (w.), 07.x.2008, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record).

### ***Tetramorium shivalikense* Bharti and Kumar, 2012**

**Type locality:** India: Himachal Pradesh: Andretta, Chanaur, Dattal, Ghatti, Palampur, Siholi, Terrace; Punjab: Dharampur; Uttarakhand: Forest Research Institute, Selaqui

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material Examined: Himachal Pradesh:** Andretta, 2 (w.), 11.vi.2010; Chanaur, 2 (w.), 3.x.2009; Dattal, 1 (w.), 16.vi.2010; Ghatti, 4 (w.), 27.ix.2009; Palampur, 8 (w.), 14.vi.2010; Siholi, 18 (w.), 19.x.2008; Terrace, 12 (w.), 11.x.2008, 1 (w.), 25.v.2009, 1 (w.), 24.ix.2009. **Punjab:** Dharampur, 1 (w.), 14.x.2008. **Uttarakhand:** Forest Research Institute, 50 (w.), 14.viii.2009, 1 (w.), 17.viii.2009; Selaqui, 1 (w.), 9.viii.2009, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Punjab and Uttarakhand (Bharti and Kumar, 2012c: 13).

### ***Tetramorium simillimum* (Smith, F., 1851)**

*Myrmica simillima* Smith, F., 1851

*Myrmica parallela* Smith, 1859

*Tetramorium pygmaeum* Emery, 1877

*Tetramorium simillimum* var. *insulare* Santschi, 1928

*Wasmannia auropunctata* subsp. *brevispinosa* Borgmeier, 1928

*Tetramorium simillimum* r. *denticulatum* 1902

*Tetramorium pusillum* var. *bantouana* Santschi, 1910

*Tetramorium simillimum* var. *opacior* Forel, 1913

*Tetramorium pusillum* var. *exoleta* Santschi, 1914

*Tetramorium pusillum* st. *bantuala* var. *breve* Santschi, 1924

**Type locality:** Great Britian: England: Dorset

**Type depository:** ST: Lost

**Material Examined: Himachal Pradesh:** Bajaura, 24 (w.), 5 (q.), 3 (m.), 23.vi.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Punjab (Imai *et al.*, 1984: 8; Bolton, 1977: 131).

### ***Tetramorium smithi* Mayr, 1879**

*Tetramorium simillimum* r. *laevinode* Forel, 1902

*Tetramorium smithi* var. *kanariense* Forel, 1902

**Type locality:** India: West Bengal: Kolkata

**Type depository:** ST: BMNH, NHMW

**Material Examined: Himachal Pradesh:** Bilaspur, 6 (w.), 01.vii.2010; Chanaur, 16 (w.), 03.x.2009; Dehra, 3 (w.), 06.vii.2010; Guga, 2 (w.), 06.x.2008. **Jammu and Kashmir:** Mansar, 1 (w.), 31.vii.2010. **Punjab:** Dunera, 4 (w.), 23.vi.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Punjab (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 89).

### ***Tetramorium tonganum* Mayr, 1870**

*Tetramorium magitae* Forel, 1911

**Type locality:** Tonga: Tongtapu

**Type depository:** ST: NHMW

**Material Examined: Himachal Pradesh:** Andretta, 28 (w.), 3 (q.), 8 (m.), 20.vi.2010; Baijnath, 14 (w.), 13 (q.), 8 (m.), 17.vi.2010; Lwasa, 1 (w.), 07.v.2009; Mandi, 14 (w.), 27.vi.2010. **Uttarakhand:** Forest Research Institute, 1 (w.), 17.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bharti and Kumar, 2012c: 23).

### ***Tetramorium triangulatum* Bharti and Kumar, 2012**

**Type locality:** India: Himachal Pradesh: Andretta; Punjab: Patiala; Uttarakhand: Assan Barrage

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material Examined: Himachal Pradesh:** Andretta, 47 (w.), 10 (q.), 7 (m.), 19.vi.2010; **Uttarakhand:** Assan Barrage, 1 (w.), 10.v.2009, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bharti and Kumar, 2012c: 16).

### ***Tetramorium walshi* (Forel, 1890)**

*Triglyphothrix walshi* Forel, 1890

*Triglyphothrix musculus* Forel, 1902

*Triglyphothrix walshi* var. *spuria* Forel, 1912

**Type locality:** India: Bengal; Maharashtra: Pune; Odhisa: Puri

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Ghatti, 5 (w.), 27.ix.2009, 2 (w.), 03.x.2009, 40 (w.), 05.x.2009; Paonta Sahib, 2 (w.), 19.viii.2009; Siholi, 31 (w.), 14.x.2009, 15 (w.), 19.vii.2010; Dehra, 15 (w.), 06.vii.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Imai *et al.*, 1984: 8; Bharti *et al.*, 2009: 38).

### ***Trichomyrmex aberrans* (Forel, 1902)**

*Monomorium aberrans* Forel, 1902

**Type locality:** India: Madhya Pradesh: Pachmarhi

**Type depository:** ST: MHNG

**Material Examined: Himachal Pradesh:** Andretta, 1 (w.), 11.vi.2010; Baijnath, 7 (w.), 17.vi.2010; Bakhra, 1 (w.), 07.x.2008; Bilaspur, 6 (w.), 01.vii.2010; Ghatti, 4 (w.), 27.ix.2009, 30 (w.), 28.ix.2009; Kandwal, 3 (w.), 23.vii.2010; Khajjiyan, 6 (w.), 19.vi.2009; Khatiar, 1 (w.), 18.x.2008, 10 (w.), 03.vi.2009; Kotla, 21 (w.), 13.x.2008; Mandi, 8 (w.), 30.v.2009, 7 (w.), 27.vi.2010; Paonta Sahib, 4 (w.), 19.viii.2009; Rehan, 6 (w.), 08.vii.2010; Suketi, 11 (w.), 25.viii.2009; Terrace, 35 (w.), 11.x.2008, 10 (w.), 23.v.2009. **Jammu and Kashmir:** Mansar, 5 (w.), 13.vii.2009; Surinsar, 9 (w.), 01.viii.2010. **Punjab:** Dunera, 6 (w.), 23.vi.2009. **Uttarakhand:** Forest Research Institute, 12 (w.), 01.viii.2009; Ranger's College, 1 (w.), 02.viii.2009; Selaqui, 16 (w.), 08.viii.2009, 13 (w.), 05.ix.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Punjab and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 87).

### ***Trichomyrmex destructor* (Jerdon, 1851)**



## Ants in Northwestern Shivalik

*Atta destructor* Jerdon, 1851

*Myrmica basalis* Smith, F., 1858

*Myrmica atomaria* Gerstäcker, 1859

*Myrmica ominosa* Gerstäcker, 1859

*Myrmica gracillima* Smith, F., 1861

*Myrmica vexator* Smith, F., 1861

**Type locality:** India: Kerala: Malabar

**Type depository:** T: Unknown

**Material Examined: Himachal Pradesh:** Andretta, 23 (w.), 1 (q.), 2 (m.), 20.vi.2010; Bajaura, 32 (w.), 1 (q.), 23.vi.2010; Bari, 22 (w.), 06.vi.2009, 40 (w.), 01.x.2009; Bilaspur, 28 (w.), 01.vii.2010; Chanaur, 22 (w.), 20.x.2008; Ghamrur, 12 (w.), 01.vi.2009; Ghatti, 11 (w.), 12.x.2008, 10 (w.), 28.ix.2009, 17 (w.), 05.x.2009, 6 (w.), 11.vii.2010; Guraldhar, 35 (w.), 04.x.2009; Khajjiyan, 16 (w.), 19.vi.2009; Khatiar, 21 (w.), 18.x.2008; Khushinagar, 20 (w.), 17.vi.2009; Nahan, 20 (w.), 04.vi.2010; Siholi, 41 (w.), 04.vi.2009; Terrace, 14 (w.), 11.x.2008, 3 (w.), 21.x.2008, 20 (w.), 23.v.2009, 6 (w.), 24.v.2009, 7 (w.), 1 (q.), 2 (m.), 26.v.2009, 12 (w.), 25.ix.2009. **Jammu and Kashmir:** Billawar, 13 (w.), 06.viii.2010; Surinsar, 10 (w.), 14.vii.2009. **Punjab:** Dunera, 4 (w.), 23.vi.2009; Thein Dam, 10 (w.), 20.vi.2009. **Uttarakhand:** Forest Research Institute, 11 (w.), 29.v.2010; Rajaji Forest Area, 12 (w.), 05.viii.2009, leg. R. Kumar. **Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 87), Punjab (Bharti *et al.*, 2009: 38).

### *Trichomyrmex glaber* (André, 1883)

*Holcomyrmex glaber* André, 1883

*Holcomyrmex glaber* var. *clarus* Forel, 1902

*Holcomyrmex glaber* var. *glabrocriniceps* Forel, 1902

**Type locality:** India: Tamil Nadu: Chennai

**Type depository:** ST: MNHN

**Material Examined: Himachal Pradesh:** Jogi Panga, 12 (w.), 09.x.2008; Kotla, 15 (w.), 22.x.2008. **Punjab:** Dunera, 4 (w.), 24.vii.2010; Thein Dam, 18 (w.), 20.vi.2009. **Uttarakhand:** Rajaji Forest Area, 12 (w.), 21.v.2010, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 87), Punjab (Bharti *et al.*, 2009: 38).

### *Trichomyrmex scabriceps* (Mayr, 1879)

*Holcomyrmex scabriceps* Mayr, 1879

*Holcomyrmex scabriceps* var. *crinicipitoscabriceps* Forel, 1902

**Type locality:** India: West Bengal: Kolkata

**Type depository:** ST: BMNH, NHMW

**Material Examined: Himachal Pradesh:** Bakhra, 34 (w.), 07.x.2008; Bari, 6 (w.), 01.x.2009; Bilaspur, 16 (w.), 01.vii.2010; Chanaur, 4 (w.), 20.x.2008; Ghatti, 24 (w.), 27.ix.2009; Guraldhar, 13 (w.), 16.x.2008; Jogi Panga, 42 (w.), 09.x.2008; Kandwal, 26 (w.), 23.vii.2010; Khatiar, 12 (w.), 11.x.2009; Khushinagar, 10 (w.), 17.vi.2009; Kotla, 11 (w.), 13.x.2008, 30 (w.), 22.x.2008, 16 (w.), 23.x.2008, 7 (w.), 29.ix.2009; Nahan, 28 (w.), 23.viii.2009; Rehan, 3 (w.), 08.vii.2010; Renuka, 7 (w.), 08.v.2009; Siholi, 11 (w.), 14.x.2009; Suketi, 7 (w.), 25.viii.2009; Terrace, 11 (w.), 21.x.2008. **Jammu and Kashmir:** Jasrota, 7 (w.), 28.vii.2010. **Punjab:** Chohal, 16 (w.), 08.x.2008; Thein Dam, 13 (w.), 20.vi.2009. **Uttarakhand:** Rajaji Forest Area, 05.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 87), Punjab (Imai *et al.*, 1984: 7; Tak, 2009: 22).

### *Vollenhovia gasteropunctata* Bharti and Kumar, 2013

**Type locality:** India: Himachal Pradesh: Andretta

**Type depository:** HT, PT: PUAC

**Material Examined: Himachal Pradesh:** Andretta, 2 (w.), 15.vi.2010, leg. R. Kumar (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Kumar, 2013c: 68).

## Subfamily Ponerinae

### *Anochetus cryptus* Bharti and Wachkoo, 2013

**Type locality:** India: Jammu and Kashmir: Billawar, Manda, Surinsar; Himachal Pradesh: Chanaur

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material Examined: Himachal Pradesh:** Chanaur, 2 (w.), 5.vi.2009. **Jammu and Kashmir:** Billawar, 2 (w.), 6.viii.2010; Manda, 4 (w.), 1 (q.), 15.vii.2009; Surinsar, 1 (w.), 1.viii.2010, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (Bharti and Wachkoo, 2013b: 138).

### *Anochetus graeffei* Mayr, 1870

*Anochetus punctiventris* Mayr, 1879

*Anochetus rudis* Emery, 1889

*Anochetus punctiventris* subsp. *oceanicus* Emery, 1897

*Anochetus punctiventris* r. *taylori* Forel, 1900

*Anochetus amati* Karavaiev, 1925

*Anochetus minutus* Karavaiev, 1925

**Type locality:** Samoa: Upolu Island

**Type depository:** LT, PLT: NHMW

**Material examined: Himachal Pradesh:** Andretta, 15 (w.), 12.vi.2010; Bari, 1 (w.), 1.x.2009; Bilaspur, 8 (w.), 1.vii.2010, 1 (w.), 2.vii.2010; Chanaur, 6 (w.), 20.x.2008, 7 (w.), 5.vi.2009, 9 (w.), 12.vi.2009; Guraldhar, 2 (w.), 16.x.2008, 16 (w.), 2.vi.2009, 1 (w.), 4.x.2009; Kotla, 3 (w.), 30.v.2009, 1 (w.), 13.vii.2010; Lwasa, 44 (w.), 1 (q.), 27.viii.2009; Renuka, 1 (w.), 26.viii.2009; Suketi, 2 (w.), 25.viii.2009; Terrace, 7 (w.), 15.vii.2010. **Jammu and Kashmir:** Kathua, 1 (w.), 27.vii.2010; 4 (w.), 1 (q.), 15.vii.2009; Manda, 2 (w.), 4.viii.2010; Udampur, 5 (w.), 4.vii.2009. **Uttarakhand:** Assan Barrage, 9 (w.), 10.v.2009, 2 (w.), 3.vi.2010; Forest Research Institute, 2 (w.), 12.v.2009, 6 (w.), 14.viii.2009; Ranger's College, 6 (w.), 4.viii.2009, 21 (w.), 2 (m.), 22.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 89).

### *Anochetus madaraszi* Mayr, 1897

**Type locality:** India: Karnataka: Kanara; Sri Lanka: Kalawewa

**Type depository:** ST: NHMW

**Material examined: Jammu and Kashmir:** Mansar, 3 (w.), 13.vii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (new record).

### *Anochetus myops* Emery, 1893

**Type locality:** Malaysia: Perak

**Type depository:** HT: MSNG

**Material examined: Himachal Pradesh:** Andretta, 4 (w.), 12.vi.2010, 3 (w.), 13.vi.2010. **Uttarakhand:** Forest Research Institute, 2 (w.), 30.ix.2008, 26 (w.), 11.v.2009, 1 (w.), 13.v.2009, 2 (w.), 30.vii.2009, 39 (w.), 1.viii.2009, 1 (w.), 3.viii.2009, 6 (w.), 4.viii.2009, 7 (w.), 14.viii.2009, 10 (w.), 16.viii.2009, 12 (w.), 20.v.2010, 3 (w.), 4.ix.2010; Rajaji Forest Area, 1 (w.), 12.viii.2009, 1 (w.), 13.viii.2009; Selaqui, 1 (q.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### *Anochetus sedilloti* Emery, 1884

*Anochetus sedilloti* var. *indicus* Forel, 1900

**Type locality:** Tunisia: Gabès, Gafsa

**Type depository:** ST: MSNG

**Material examined:** **Punjab:** Ropar, 9 (w.), 15.vi.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Punjab (new record).

### ***Anochetus validus* Bharti and Wachkoo, 2013**

**Type locality:** India: Jammu and Kashmir: Billawar, Jasrota, Kathua, Manda, Mansar, Samba

**Type depository:** HT, PT: PUAC; PT: BMNH

**Material examined:** **Jammu and Kashmir:** Billawar, 4 (w.), 6.viii.2010; Jasrota, 1 (w.), 28.vii.2010; Kathua, 1 (w.), 27.vii.2010; Manda, 1 (w.), 1 (q.), 15.vii.2009, 10 (w.), 4.viii.2010; Mansar, 1 (w.), 13.vii.2009; Samba, 3 (w.), 11.vii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti and Wachkoo, 2013b: 141).

### ***Bothroponera tesseronoda* (Emery, 1877)**

*Ponera tesseronoda* Emery, 1877

**Type locality:** India: West Bengal: Kolkata

**Type depository:** ST: NHMW

**Material examined:** **Himachal Pradesh:** Nahan, 54 (w.), 23.viii.2009. **Uttarakhand:** Dakpathar, 82 (w.), 20.viii.2009; Selaqui, 7 (w.), 3.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Punjab (Bharti *et al.*, 2009: 38), Uttarakhand (Forel, 1900a: 325, 1906: 91).

### ***Brachyponera jerdonii* (Forel, 1900)**

*Ponera jerdonii* Forel, 1900

**Type locality:** India: Assam; Kerala: Calicut; Maharashtra: Pune; West Bengal: Kolkata, Barrackpore

**Type depository:** ST: MHNG

**Material examined:** **Jammu and Kashmir:** Sukrala, 12 (w.), 7.viii.2010. **Uttarakhand:** Assan Barrage, 7 (w.), 10.v.2009, 17 (w.), 21.viii.2009, 1 (w.), 3.vi.2010; 20 (w.), 1 (q.), Selaqui, 2.x.2008, 8 (w.), 3.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir and Uttarakhand (new record).

### ***Brachyponera luteipes* (Mayr, 1862)**

*Ponera luteipes* Mayr, 1862

**Type locality:** Andaman and Nicobar Islands: Nicobar Islands

**Type depository:** ST: NHMW

**Material examined:** **Himachal Pradesh:** Andretta, 7 (w.), 11.vi.2010, 18 (w.), 13.vi.2010, 2 (w.), 14.vi.2010, 1 (w.), 20.vi.2010; Baijnath, 14 (w.), 17.vi.2010, 7 (w.), 23.vi.2010; Bakhra, 21 (w.), 7.x.2008; Bari, 25 (w.), 15.x.2008, 1 (w.), 6.vi.2009; Billawar, 11 (w.), 6.viii.2010; Chanaur, 37 (w.), 20.x.2008; Ghamrur, 1 (w.), 1.vi.2009; Ghatti, 8 (w.), 17.x.2008, 61 (w.), 28.ix.2009, 11 (w.), 5.x.2009, 53 (w.), 12.x.2008, 2 (w.), 13.x.2009; Guga, 29 (w.), 6.x.2008; Guraldhar, 38 (w.), 16.x.2008, 8 (w.), 4.x.2009; Jogi Panga, 37 (w.), 9.x.2008; Khatiar, 28 (w.), 18.x.2008, 5 (w.), 11.x.2009; Kotla, 23 (w.), 13.x.2008, 17 (w.), 22.x.2008; Kushinagar, 5 (w.), 17.vi.2009, Lwasa, 5 (w.), 8 (w.), 7.v.2009, 27.viii.2009; Mandi, 1 (w.), 27.vi.2010, Palampur, 1 (w.), 18.vi.2010; Nagabari, 2 (w.), 18.vi.2009; Nahan, 4 (w.), 23.viii.2009; Poanta Sahib, 9 (w.), 4 (m.), 9.v.2009; Pong Dam, 2 (w.), 17.x.2008; Renuka, 6 (w.), 8.v.2009, 17 (w.), 1 (q.), 26.viii.2009; Rewalsar, 12 (w.), 2 (q.), 29.vi.2010; Siholi, 56 (w.), 19.x.2008; Terrace, 374 (w.), 11.x.2008, 21 (w.), 21.x.2008, 27 (w.), 23.x.2008, 2 (w.), 23.v.2009, 12 (w.), 24.v.2009, 30 (w.), 25.v.2009, 2 (w.), 26.v.2009, 26 (w.), 13.vi.2009, 25 (w.), 23.ix.2009, 70 (w.), 24.ix.2009, 2 (w.), 25.ix.2009, 1 (w.), 12.x.2009, 7 (w.), 17.vii.2010, 8 (w.), 19.vii.2010; Una, 51 (w.), 5.x.2008. **Jammu and Kashmir:** Kathua, 1 (w.), 23.vii.2010, 4 (w.), 29.vii.2010; Manda, 3 (w.), 15.vii.2009; Mansar, 1 (w.), 12.vii.2009, 2 (w.),

13.vii.2009; Surinsar, 7 (w.), 14.vii.2009, 5 (w.), 1.viii.2010.

**Punjab:** Chohal, 56 (w.), 8.x.2008; Dunera, 1 (w.), 24.vii.2010.

**Uttarakhand:** Assan Barrage, 3 (w.), 10.v.2009; Dakpathar, 11 (w.), 1 (m.), 20.viii.2009; Forest Research Institute, 24 (w.), 30.ix.2008, 8 (w.), 12.v.2009, 1 (w.), 31.vii.2009, 1 (w.), 1.viii.2009, 2 (w.), 4.viii.2009, 3 (w.), 16.viii.2009, 1 (w.), 20.v.2010; Rajaji Forest Area, 16 (w.), 5.viii.2009, 40 (w.), 1(q.), 11.viii.2009, 116 (w.), 12.viii.2009, 7 (w.), 13.viii.2009, 12 (w.), 6.ix.2010, 1 (w.), 7.ix.2010; Ranger's College, 1 (w.), 22.v.2010, 5 (w.), 25.v.2010; Selaqui, 14 (w.), 2.x.2008, 42 (w.), 3.x.2008, 4 (w.), 7.viii.2009, 59 (w.), 8.viii.2009, 40 (w.), 9.viii.2009, 14 (w.), 10.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1900a: 326, 1906: 91), Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Bharti *et al.*, 2009: 38), Uttarakhand (Forel, 1900a: 326, 1906: 91).

### ***Buniapone amblyops* (Emery, 1887)**

*Ponera amblyops* Emery, 1887

**Type locality:** Indonesia: Sumatra: Ajer Mantcior

**Type depository:** ST: MSNG

**Material examined:** **Uttarakhand:** Dakpathar, 1 (q.), 20.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

### ***Cryptopone subterranea* Bharti and Wachkoo, 2013**

**Type locality:** India: Jammu and Kashmir: Surinsar; Himachal Pradesh: Nagabari

**Type depository:** HT, PT: PUAC

**Material examined:** **Himachal Pradesh:** Nagabari, 1 (w.), 18.vii.2009. **Jammu and Kashmir:** Surinsar, 1 (w.), 14.vii.2009, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (Bharti and Wachkoo, 2013c: 3).

### ***Ectomomyrmex striolatus* (Donisthorpe, 1933)**

*Pachycondyla striolata* Donisthorpe, 1933

**Type locality:** India: Uttarakhand: Dehradun

**Type depository:** ST: BMNH

**Material examined:** **Himachal Pradesh:** Andretta, 14 (w.), 11.vi.2010, 1 (w.), 13.vi.2010, 2 (w.), 20.vi.2010; Lwasa, 1 (w.), 1 (q.), 27.viii.2009; Mandi, 1 (w.), 27.vi.2010. **Uttarakhand:** Forest Research Institute, 5 (w.), 12.v.2009, 4 (w.), 1.viii.2009, 1 (w.), 3.x.2009, 1 (w.), 4.ix.2010; Rajaji Forest Area, 1 (w.), 5.viii.2009, 3 (w.), 6.viii.2009, 2 (w.), 11.viii.2009, 5 (w.), 12.viii.2009, 1 (w.), 13.viii.2009, 1 (w.), 25.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Uttarakhand (Donisthorpe, 1933: 194).

### ***Harpegnathos venator* (Smith, 1858)**

*Drepanognathus venator* Smith, 1858

**Type locality:** India: Tamil Nadu: Chennai

**Type depository:** HT: BMNH

**Material examined:** **Himachal Pradesh:** Bari, 1 (w.), 6.vi.2009; Bilaspur, 1 (w.), 2.vii.2010; Chanaur, 1 (w.), 5.vi.2009; Lwasa, 1 (w.), 27.viii.2009; Nahan, 1 (w.), 1 (q.), 23.viii.2009; Renuka, 1 (w.), 26.viii.2009; Terrace, 1 (w.), 21.x.2008. **Jammu and Kashmir:** Surinsar, 1 (w.), 16.vii.2009. **Punjab:** Dunera, 1 (w.), 24.vii.2010; Thein Dam, 3 (w.), 4.vi.2009. **Uttarakhand:** Selaqui, 2 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Bharti *et al.*, 2009: 38), Uttarakhand (Forel, 1900b: 64, 1906: 92; Donisthorpe, 1937: 199).

### ***Hypoponera assmuthi* (Forel, 1905)**



## Ants in Northwestern Shivalik

*Ponera abeillei* r. *assmuthi* Forel, 1905

**Type locality:** India: Maharashtra: Mumbai: Khandala

**Type depository:** ST: MHNG

**Material examined: Jammu and Kashmir:** Jasrota, 1(w.), 28.vii.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti *et al.*, 2015: 40).

### *Hypoponera confinis* (Roger, 1860)

*Ponera confinis* Roger, 1860

*Ponera convexiuscula* var. *nautarum* Santschi, 1938

**Type locality:** Sri Lanka

**Type depository:** T: Unknown

**Material examined: Himachal Pradesh:** Andretta, 2 (w.), 12.vi.2010, 6 (w.), 5 (q.), 13.vi.2010; Ghatti, 1 (w.), 12.x.2008, 2 (w.), 28.ix.2009; Kotla, 2 (q.), 30.ix.2009; Nahan, 1 (w.), 20.viii.2009, Rewalsar, 1 (w.), 20.vi.2010, Siholi, 1 (w.), 2.x.2009; Terrace, 37 (w.), 6 (q.), 11.x.2008, 12 (w.), 3 (q.), 24.ix.2009, 2 (w.), 25.ix.2009, 2 (w.), 19.vii.2010. **Jammu and Kashmir:** Manda, 1 (w.), 1 (q.), 15.vii.2009, 2 (w.), 4.viii.2010, Surinsar, 15 (w.), 4 (q.), 1.viii.2010; Udhampur, 1 (q.), 4.vii.2009. **Uttarakhand:** Dakpathar, 1 (w.), 20.viii.2009; Forest Research Institute, 2 (w.), 1 (q.), 30.ix.2008; Rajaji Forest Area, 48 (w.), 1 (q.), 2 (m.), 5.viii.2009, 3 (q.), 6.viii.2009, 7 (w.), 6 (q.), 11.viii.2009, 7 (w.), 9 (q.), 12.viii.2009, 1 (w.), 13.viii.2009, 1 (w.), 6.ix.2010, 2 (w.), 7.ix.2010; Selaqui, 10 (w.), 8.viii.2009, 2 (w.), 2 (q.), 9.viii.2009, 9 (w.), 9 (q.), 5.ix.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bharti *et al.*, 2015: 42), Jammu and Kashmir (Bharti *et al.*, 2013a: 89; Bharti *et al.*, 2015: 42).

### *Hypoponera ragusai* (Emery, 1894)

*Ponera ragusai* Emery, 1894

*Ponera gleadowi* Emery, 1895

*Ponera gleadowii* r. *decipiens* Forel, 1899

*Ponera gleadowi* subsp. *aethiopica* Forel, 1907

*Ponera ragusai* var. *santschii* Emery, 1909

*Ponera japonica* r. *formosae* Forel, 1913

*Ponera lesnei* Bondroit, 1916

*Ponera parva* Bondroit, 1918

*Ponera massiliensis* Bondroit, 1920

*Ponera gyptis* Santschi, 1921

*Ponera oblongiceps* Smith, M.R., 1939

**Type locality:** Italy: Sicily

**Type depository:** ST: MSNG

**Material examined: Himachal Pradesh:** Bilaspur, 21 (w.), 1.vii.2010; Kandwal, 13 (w.), 25.vi.2009; Terrace, 1 (w.), 24.ix.2009, 2 (w.), 15.vii.2010. **Jammu and Kashmir:** Jasrota, 2 (w.), 28.vii.2010, Mansar, 3 (w.), 12.vii.2009, 3 (w.), 1 (q.), 13.vii.2009; Surinsar, 2 (w.), 14.vii.2009. **Punjab:** Dunera, 5 (w.), 24.vii.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Punjab (Bharti *et al.*, 2015: 47), Uttarakhand (Forel, 1900a: 327, 1906: 91).

### *Hypoponera wroughtonii* (Forel, 1900)

*Ponera confinis* var. *wroughtonii* Forel, 1900

**Type locality:** India: Karnataka: Kanara

**Type depository:** ST: MHNG

**Material examined: Himachal Pradesh:** Andretta, 29 (w.), 12.vi.2010, 36 (w.), 13.vi.2010; Khatiar, 13 (w.), 2 (q.), 1 (m.), 18.x.2008; Kotla, 1 (w.), 13.x.2008, Rewalsar, 30 (w.), 20.vi.2010; Siholi, 21 (w.), 1 (q.), 19.x.2008; Terrace, 37 (w.), 3 (q.), 11.x.2008, 2 (w.), 23.v.2009, 5 (w.), 25.v.2009, 1 (w.), 23.ix.2009, 10 (w.), 25.ix.2009. **Uttarakhand:** Forest Research Institute, 9 (w.), 2 (q.), 2.viii.2009, Rajaji Forest Area, 1 (q.), 6.viii.2009, 3 (w.), 1 (q.), 11.viii.2009, 1 (w.), 12.viii.2009, 1 (w.),

13.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bharti *et al.*, 2015: 49).

### *Leptogenys chinensis* (Mayr, 1870)

*Lobopelta chinensis* Mayr, 1870

**Type locality:** China

**Type depository:** ST: NHMW

**Material examined: Jammu and Kashmir:** Manda, 11 (w.), 6.vii.2009. **Uttarakhand:** Ranger's College, 2 (w.), 30.vii.2009, 3 (w.), 2.viii.2009, 2 (w.), 4.viii.2009, 1 (w.), 6.viii.2009, 2 (w.), 14.viii.2009, 1 (w.), 9.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir and Uttarakhand (new record).

### *Leptogenys diminuta laeviceps* (Smith, 1857)

*Ponera laeviceps* Smith, 1857

**Type locality:** Malaysia: Borneo: Sarawak

**Type depository:** ST: BMNH

**Material examined: Himachal Pradesh:** Andretta, 30 (w.), 11.vi.2010, 22 (w.), 13.vi.2010, 80 (w.), 20.vi.2010; Ghatti, 5 (w.), 12.x.2008, 3 (w.), 17.x.2008, 29 (w.), 13.x.2009; Jol, 34 (w.), 6.x.2009; Kotla, 30 (w.) 13.x.2008, 30 (w.), 30.ix.2009; Nagabari, 7 (w.), 18.vi.2009; Renuka, 5 (w.), 26.viii.2009; Siholi, 3 (w.), 19.x.2008, 1 (w.), 1.x.2009; Suketi, 20 (w.), 25.viii.2009; Terrace, 91 (w.), 11.x.2008, 15 (w.), 21.x.2008, 1 (w.), 23.x.2008, 15 (w.), 25.v.2009, 1 (w.), 25.vii.2009, 4 (w.), 23.ix.2009, 1 (w.), 12.x.2009, 1 (w.), 15.vii.2010. **Jammu and Kashmir:** Billawar, 15 (w.), 6.viii.2010. **Punjab:** Dharampur, 46 (w.), 14.x.2008; Thein Dam 32 (w.), 4.vi.2009. **Uttarakhand:** Dakpathar, 2 (w.), 20.viii.2009; Forest Research Institute, 22 (w.), 30.vii.2009, 20 (w.), 1.viii.2009; Rajaji Forest Area, 5 (w.), 10.viii.2009, 12 (w.), 21.v.2010, 1 (w.), 25.v.2010, 30 (w.), 2 (m.), 6.ix.2010; Selaqui, 50 (w.), 2 (m.), 3.x.2008, 3 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Jammu and Kashmir (new record), Punjab (Bharti *et al.*, 2009: 38), Uttarakhand (Forel, 1900a: 312, 1906: 91; Imai *et al.*, 1984: 5).

### *Leptogenys hystERICA* Forel, 1900

**Type locality:** India: Karnataka: Belgaum; Kanara; Sri Lanka

**Type depository:** ST: NHMB

**Material examined: Himachal Pradesh:** Renuka, 1 (w.), 26.viii.2009. **Uttarakhand:** Forest Research Institute, 1 (w.), 12.v.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record).

### *Leptogenys lattkei* Bharti and Wachkoo, 2013

**Type locality:** India: Himachal Pradesh: Kangra: Andretta

**Type depository:** HT, PT: PUAC; PT: BMNH, CASC

**Material examined: Himachal Pradesh:** Andretta, 2 (w.), 11.vi.2010; 2 (w.), 12.vi.2010, 3 (w.), 13.vi.2010, 1 (w.), 20.vi.2010, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Wachkoo, 2013d: 12).

### *Leptogenys lucidula* Emery, 1895

*Leptogenys huangdii* Xu, 2000

**Type locality:** Myanmar: Carin Cheba

**Type depository:** ST: MSNG

**Material examined: Uttarakhand:** Forest Research Institute, 13 (w.), 12.v.2009; Selaqui, 12 (w.), 9.viii.2009, 6 (w.), 7.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Uttarakhand (new record).

***Leptogenys transitionis* Bharti and Wachkoo, 2013**

**Type locality:** India: Himachal Pradesh: Sirmaur: Lwasa

**Type depository:** HT, PT: PUAC; PT: BMNH, CASC

**Material examined:** Himachal Pradesh: Lwasa, 10 (w.), 1 (ergatogyne), 13.x.2008, leg. Aijaz A. Wachkoo (type series).

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Wachkoo, 2013d: 14).

***Myopias shivalikensis* Bharti and Wachkoo, 2012**

**Type locality:** India: Jammu and Kashmir: Surinsar

**Type depository:** HT: PUAC

**Material examined:** Jammu and Kashmir, Surinsar, 1 (w.), 14.vii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Jammu and Kashmir (Bharti and Wachkoo, 2012c: 34).

***Odontomachus monticola* Emery, 1892**

*Odontomachus monticola* var. *longi* Forel, 1900

*Odontomachus monticola* r. *punctulatus* Forel, 1900

*Odontomachus monticola* var. *formosae* Forel, 1912

*Odontomachus monticola* var. *major* Forel, 1913

*Odontomachus monticola* subsp. *pauperculus* Wheeler, 1921

*Odontomachus monticola* var. *hainanensis* Stitz, 1925

*Odontomachus latidens* subsp. *striata* Menozzi, 1930

**Type locality:** Myanmar: Carin Ghecù

**Type depository:** LT, PLT: MSNG

**Material examined:** Himachal Pradesh: Andretta, 6 (w.), 19.vi.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 89).

***Odontoponera denticulata* (Smith, 1858)**

*Ponera denticulata* Smith, 1858

**Type locality:** Singapore

**Type depository:** HT: BMNH

**Material examined:** Himachal Pradesh: Andretta, 2 (w.), 11.vi.2010, 1 (w.), 13.vi.2010, 1 (w.), 14.vi.2010, 1 (w.), 15.vi.2010, 1 (w.), 21.vi.2010; Baijnath, 2 (w.), 17.vi.2010; Bakhra, 28 (w.), 7.x.2008; Bari, 2 (w.), 15.x.2008, 1 (w.), 1.x.2009, 14 (w.), 2.vii.2010; Billawar, 1 (w.), 30.vii.2010; Chanaur, 86 (w.), 20.x.2008, 1 (w.), 5.vi.2009; Dehra, 3 (w.), 6.vii.2010; Gagret, 2 (w.), 8.x.2008; Ghatti, 58 (w.), 12.x.2008, 1 (w.), 17.x.2008, 6 (w.), 28.ix.2009, 1 (w.), 5.x.2009, 1 (w.), 13.x.2009, Guga, 35 (w.), 6.x.2008, 1 (w.), 7.x.2008; Guraldhar, 101 (w.), 16.x.2008, 2 (w.), 4.x.2009; Jogi Panga, 35 (w.), 9.x.2008; Jol, 1 (w.), 6.x.2009; Khatiar, 35 (w.), 1 (q.), 18.x.2008, 1 (w.), 11.x.2009; Kotla, 76 (w.), 13.x.2008, 26 (w.), 22.x.2008, 1 (w.), 30.v.2009, 1 (w.), 29.ix.2009, 1 (w.), 30.ix.2009; Lwasa, 26 (w.), 27.viii.2009; Mandi, 2 (w.), 27.vi.2010; Nagabari, 9 (w.), 18.vi.2009; Nahan, 1 (w.), 6.v.2009; Poanta Sahib, 1 (w.), 9.v.2009; Renuka, 51 (w.), 26.viii.2009, 2 (w.), 26.ix.2009; Siholi, 74 (w.), 19.x.2008, 52 (w.), 14.x.2009; 2 (w.), 8.vii.2010; Terrace, 66 (w.), 11.x.2008, 15 (w.), 21.x.2008, 13 (w.), 23.x.2008, 5 (w.), 24.v.2009, 1 (w.), 12.vii.2009, 15 (w.), 13.vi.2009, 2 (w.), 23.ix.2009, 20 (w.), 24.ix.2009, 3 (w.), 25.ix.2009, 2 (w.), 12.x.2009, 27 (w.), 9.vii.2010, 1 (w.), 19.vii.2010; Una, 8 (w.), 5.x.2008. **Jammu and Kashmir:** Kathua, 1 (w.), 27.vii.2010; Manda, 2 (w.), 15.vii.2009; Mansar, 52 (w.), 12.vii.2009, 2 (w.), 3.viii.2010; Sukrala, 1 (w.), 7.viii.2010; Surinsar, 1 (w.), 1.viii.2010, Udhampur, 29 (w.), 4.vii.2009. **Punjab:** Chohal, 1 (w.), 8.x.2008; Dharampur, 2 (w.), 14.x.2008. **Uttarakhand:** Dakpathar, 2 (w.), 20.viii.2009; Forest Research Institute, 34 (w.), 2 (q.), 1 (m.), 30.ix.2008, 28 (w.), 1.x.2008, 46 (w.), 2 (q.), 30.vii.2009, 30 (w.), 31.vii.2009, 1 (w.), 2.viii.2009, 1 (w.), 3.viii.2009, 22 (w.), 4.viii.2009, 1 (w.), 16.viii.2009, 1 (w.), 20.v.2010, 1 (w.), 26.v.2010, 1 (w.), 4.ix.2010; Rajaji Forest Area, 1 (w.), 6.viii.2009, 6 (w.), 10.viii.2009, 35 (w.), 11.viii.2009, 6 (w.), 12.viii.2009, 2 (w.), 13.viii.2009, 1 (w.), 6.ix.2010; Selaqui,

5 (w.), 2.x.2008, 2 (w.), 7.viii.2009, 1 (w.), 8.viii.2009, 25 (w.), 9.viii.2009, 1 (w.), 5.ix.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand (new record).

***Parvaponera darwinii* (Forel, 1893)**

*Belonopelta darwinii* Forel, 1893

*Euponera lamarki* Santschi, 1913

*Cryptopone rufotestaceus* Donisthorpe, 1943

**Type locality:** Australia: Northwestern Territory: Port Darwin

**Type depository:** ST: MHNG

**Material examined:** Punjab: Sukhna, 1 (q.), 5.x.2010, 1 (q.), 17.x.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Punjab (new record).

***Platythyrea parallela* (Smith, 1859)**

*Ponera parallela* Smith, F., 1859

*Platythyrea inconspicua* Mayr, 1870

*Platythyrea coxalis* Emery, 1893

*Platythyrea pusilla* Emery, 1893

*Platythyrea subtilis* Emery, 1900

*Platythyrea wroughtonii* Forel, 1900

*Platythyrea wroughtoni* r. *victoriae* Forel, 1900

*Platythyrea coxalis* var. *tritschleri* Forel, 1901

*Platythyrea coxalis* var. *javana* Forel, 1905

*Platythyrea coxalis* var. *annamita* Forel, 1911

*Platythyrea wroughtoni* subsp. *sechellensis* Forel, 1912

*Platythyrea coxalis* var. *cylindrica* Forel, 1913

*Platythyrea parva* Crawley, 1915

*Platythyrea pusilla* var. *australis* Forel, 1915

*Platythyrea coxalis* var. *philippinensis* Viehmeyer, 1916

*Platythyrea pusilla* var. *egena* Viehmeyer, 1916

*Platythyrea cephalotes* Viehmeyer, 1924

*Platythyrea melancholica* var. *aruana* Karavaiev, 1925

*Platythyrea pulchella* Santschi, 1928

*Platythyrea pusilla* var. *pacifica* Santschi, 1928

*Platythyrea ceylonensis* Donisthorpe, 1941

**Type locality:** Indonesia: Maluku: Aru Islands

**Type depository:** HT: OUMNH

**Material examined:** Himachal Pradesh: Bari, 1 (w.), 6.vi.2009; Nahan, 5 (w.), 6.v.2009, 1 (w.), 23.viii.2009; Terrace, 2 (w.), 23.x.2008. **Jammu and Kashmir:** Mansar, 3 (w.), 12.vii.2009. **Uttarakhand:** Selaqui, 1 (w.), 1.x.2008, 4 (w.), 7.viii.2009, 1 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh, Jammu and Kashmir and Uttarakhand (new record).

***Platythyrea sagei* Forel, 1900**

**Type locality:** India: Himachal Pradesh: Dharamsala; Karnataka: Belgaum

**Type depository:** LT, PLT: MHNG

**Material examined:** Himachal Pradesh: Andretta, 2 (w.), 1 (m.), 11.vi.2010, 2 (w.), 12.vi.2010, 2 (w.), 13.vi.2010, 11.v.2014, 12 (w.), 5 (m.), leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Forel, 1900a: 315, 1906: 91; Brown, 1975: 52; Boudinot *et al.*, 2016: 60).

***Ponera indica* Bharti and Wachkoo, 2012**

**Type locality:** India: Himachal Pradesh: Andretta, Mandi, Terrace

**Type depository:** HT, PT: PUAC; PT: BMNH, CASC

**Material examined:** Himachal Pradesh: Andretta, 1 (w.), 1 (q.), 11.vi.2010; Mandi, 5 (w.), 27.vi.2010; Terrace, 6 (w.), 12.x.2008, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti and Wachkoo, 2012d: 218).



## Ants in Northwestern Shivalik

### *Ponera taylori* Bharti and Wachkoo, 2012

**Type locality:** India: Himachal Pradesh: Andretta, Rewalsar; Uttarakhand: Assan Barrage

**Type depository:** HT, PT: PUAC; PT: BMNH, CASC

**Material examined:** **Himachal Pradesh:** Andretta, 5 (w.), 11.vi.2010; Rewalsar, 5 (w.), 1 (m.), 30.vi.2010. **Uttarakhand:** Assan Barrage, 2 (w.), 10.v.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (Bharti and Wachkoo, 2012d: 221).

### *Pseudoneoponera bispinosa* (Smith, 1858)

*Pachycondyla bispinosa* Smith, F., 1858

**Type locality:** India

**Type depository:** HT: BMNH

**Material examined:** **Himachal Pradesh:** Poanta Sahib, 2 (w.), 19.viii.2009. **Uttarakhand:** Dakpathar, 3 (w.), 20.viii.2009; Forest Research Institute, 3 (w.), 30.ix.2008, 2 (w.), 1.x.2008, 3 (w.), 3.x.2008, 3 (w.), 30.vii.2009, 5 (w.), 1.viii.2009, 4 (w.), 3.viii.2009, 2 (w.), 4.viii.2009, 1 (w.), 14.viii.2009, 2 (w.), 16.viii.2009; Rajaji Forest Area, 2 (w.), 5.viii.2009, 3 (w.), 6.viii.2009, 1 (w.), 11.viii.2009, 1 (w.), 12.viii.2009, 2 (w.), 6.ix.2010, 1 (w.), 7.ix.2010; Ranger's College, 3 (w.), 25.v.2010; Selaqui, 11 (w.), 3.x.2008, 2 (w.), 7.viii.2009, 2 (w.), 24.v.2010, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Bharti *et al.*, 2009: 38), Uttarakhand (Forel, 1900a: 326, 1906: 91).

### *Pseudoneoponera rufipes* (Jerdon, 1851)

*Ponera rufipes* Jerdon, 1851

**Type locality:** India: Kerala: Malabar

**Type depository:** T: Unknown

**Material examined:** **Himachal Pradesh:** Andretta, 1 (w.), 13.vi.2010; Bakhra, 2 (w.), 7.x.2008; Bari, 3 (w.), 15.x.2008, 2 (w.), 1.x.2009, 1 (w.), 12.vii.2010; Bilaspur, 1 (w.), 2.vii.2010; Billawar, 2 (w.), 6.viii.2010; Chanaur, 1 (w.), 20.x.2008; Dehra, 2 (w.), 6.vii.2010; Gagret, 1 (w.), 8.x.2008; Ghamrur, 3 (w.), 1.vi.2009; Ghatti, 1 (w.), 12.x.2008, 1 (w.), 28.ix.2009, 2 (w.), 13.x.2009; Guga, 2 (w.), 6.x.2008; Guraldhar, 1 (w.), 16.x.2008; Jogi Panga, 1 (w.), 9.x.2008; Khatiar, 3 (w.), 18.x.2008, 3 (w.), 11.x.2009; Kotla, 7 (w.), 13.x.2008, 6 (w.), 22.x.2008, 2 (w.), 29.ix.2009, 3 (w.), 13.vii.2010; Kushinagar, 5 (w.), 17.vi.2009; Nagabari, 4 (w.), 18.vi.2009; Poanta Sahib, 1 (w.), 19.viii.2009; Renuka, 2 (w.), 26.viii.2009; Siholi, 1 (w.), 19.x.2008, 1 (w.), 1.x.2009, 1 (w.), 14.x.2009; Terrace, 3 (w.), 11.x.2008, 2 (w.), 21.x.2008, 3 (w.), 13.vi.2009, 3 (w.), 23.ix.2009, 17 (w.), 1 (q.), 24.ix.2009, 1 (w.), 10.vii.2010; Una, 2 (w.), 5.x.2008. **Jammu and Kashmir:** Kathua, 1 (w.), 23.vii.2010, 1 (w.), 27.vii.2010; Manda, 1 (w.), 6.vii.2009, 3 (w.), 15.vii.2009, 1 (w.), 2.viii.2010; Mansar, 12 (w.), 12.vii.2009, 1 (w.), 3.viii.2010; Sukrala, 1 (w.), 7.viii.2010; Surinsar, 1 (w.), 1.viii.2010. **Punjab:** Chohal, 2 (w.), 8.x.2008; Dharampur, 2 (w.), 14.x.2008; Dunera, 13 (w.), 24.vii.2010. **Uttarakhand:** Selaqui, 1 (w.), 8.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Bharti *et al.*, 2009: 38), Uttarakhand (Forel, 1900a: 326, 1906: 91).

## Subfamily Proceratiinae

### *Proceratium williamsi* Tiwari, 2000

*Proceratium bhutanense* Baroni Urbani and De Andrade, 2003

**Type locality:** India: Meghalaya: East Khasi Hills: Shillong: Risa Colony

**Type depository:** HT, PT: ZSIK; PT: BMNH

**Material examined:** **Uttarakhand:** Dakpathar, 4 (w.), 20.viii.2009; Rajaji Forest Area, 3 (w.), 11.viii.2009, 1 (w.), 12.viii.2009, leg. Aijaz A. Wachkoo.

**Distribution in Northwestern Shivalik:** **Uttarakhand** (Baroni Urbani and De Andrade, 2003: 278; Bharti and Wachkoo, 2014b: 70).

## Subfamily Pseudomyrmecinae

### *Tetraponera allaborans* (Walker, 1859)

*Eciton minutum* Jerdon, 1851

*Eciton rufipes* Jerdon, 1851

*Pseudomyrma allaborans* Walker, 1859

*Cerapachys ceylonica* Motschoulsky, 1863

*Cerapachys femoralis* Motschoulsky, 1863

*Sima compressa* Roger, 1863

*Sima subtilis* Emery, 1889

*Sima allaborans* var. *sumatrensis* Emery, 1900

*Sima allaborans* var. *longinoda* Forel, 1909

**Type locality:** Sri Lanka

**Type depository:** ST: BMNH

**Material Examined:** **Himachal Pradesh:** Bakhra, 11 (w.), 07.x.2008; Bari, 1 (w.), 01.x.2009; Ghamrur, 1 (w.), 01.vi.2009; Guga, 1 (w.), 2 (q.), 06.x.2008; Guraldhar, 1 (w.), 1 (q.), 16.x.2008; Kandwal, 1 (w.), 25.vi.2009; Khushinagar, 1 (w.), 17.vi.2009; Kotla, 6 (w.), 1 (q.), 13.x.2008; Nahan, 1 (w.), 23.viii.2009; Terrace, 1 (w.), 23.x.2008. **Jammu and Kashmir:** Mansar, 1 (w.), 13.vii.2009; Surinsar, 2 (w.), 14.vii.2009, 3 (w.), 1.viii.2010. **Uttarakhand:** Assan Barrage, 2 (w.), 02.vi.2010; Forest Research Institute, 1 (w.), 01.viii.2009, 12 (w.), 12.viii.2009, 8 (w.), 17.viii.2009; Rajaji Forest Area, 1 (w.), 05.viii.2009; Selaqui, 1 (w.), 03.x.2008, 2 (w.), 07.viii.2009, 1 (w.), 08.viii.2009, 10 (w.), 10.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh and Uttarakhand (new record), Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Bharti *et al.*, 2009: 39).

### *Tetraponera nigra* (Jerdon, 1851)

*Eciton nigrum* Jerdon, 1851

*Tetraponera atrata* Smith, F., 1852

*Tetraponera petiolata* Smith, F., 1877

*Sima nigra* var. *insularis* Emery, 1901

*Sima nigra* r. *fergusoni* Forel, 1902

*Sima nigra* var. *krama* Forel, 1912

**Type locality:** India: Kerala: Malabar

**Type depository:** T: Unknown

**Material Examined:** **Himachal Pradesh:** Bari, 1 (w.), 15.x.2008, 1 (w.), 01.x.2009; Ghatti, 13 (w.), 28.ix.2009, 2 (w.), 27.v.2009, 3 (w.), 17.x.2008; Guraldhar, 3 (w.), 10.vi.2009; Jogi Panga, 6 (w.), 09.x.2008; Jol, 12 (w.), 06.x.2009; Kotla, 3 (w.), 28.v.2009; Paonta Sahib, 5 (w.), 09.v.2009; Suketi, 5 (w.), 25.viii.2009; Terrace, 5 (w.), 11.vi.2009. **Jammu and Kashmir:** Surinsar, 3 (w.), 14.vii.2009. **Punjab:** Chohal, 59 (w.), 08.x.2008, leg., R. Kumar. **Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti, 2001: 164), Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Bharti, 2001: 164), Uttarakhand (Forel, 1903: 709, 1906: 90; Bharti, 2001: 164; Ward, 2001: 634).

### *Tetraponera rufonigra* (Jerdon, 1851)

*Eciton rufonigrum* Jerdon, 1851

*Sima rufonigra* var. *yeensis* Forel, 1902

*Sima rufonigra* var. *testaceonigra* Forel, 1903

*Sima rufonigra* var. *ceylonensis* Forel, 1909

**Type locality:** India: Kerala: Malabar

**Type depository:** T: Unknown

**Material Examined:** **Himachal Pradesh:** Andretta, 2 (w.), 12.vi.2010; Bakhra, 1 (w.), 07.x.2008; Bilaspur, 1 (w.), 01.vii.2010; Chanaur, 5 (w.), 20.x.2008; Dhaliara, 2 (w.),

09.vi.2009; Gagret, 29 (w.), 1 (m.), 08.x.2008; Guga, 1 (w.), 06.x.2008; Khatiar, 4 (w.), 18.x.2008, 1 (w.), 11.x.2009; Kotla, 1 (w.), 28.v.2009, 1 (w.), 13.vii.2010; Nahan, 4 (w.), 23.viii.2009; Pong Dam, 24 (w.), 17.x.2008; Renuka, 5 (w.), 08.v.2009; Siholi, 3 (w.), 2 (q.), 19.x.2008; Suketi, 1 (w.), 25.viii.2009; Terrace, 1 (w.), 21.x.2008. **Jammu and Kashmir:** Samba, 3 (w.), 11.vii.2009; Sukrala, 2 (w.), 07.viii.2010. **Punjab:** Dharampur, 5 (w.), 14.x.2008; Dunera, 2 (w.), 23.vi.2009. **Uttarakhand:** Forest

Research Institute, 1 (w.), 12.v.2009, 1 (q.), 19.v.2010; Ranger's College, 1 (w.), 02.viii.2009, 1 (w.), 24.v.2010; Selaqui, 1 (w.), 09.viii.2009, leg. R. Kumar.

**Distribution in Northwestern Shivalik:** Himachal Pradesh (Bharti, 2001: 164), Jammu and Kashmir (Bharti *et al.*, 2013a: 89), Punjab (Tak and Rathore, 2004: 174; Bharti, 2001: 164; Bharti *et al.*, 2009: 39; Tak, 2009: 13, 2010: 136; Tak and Kazmi, 2011: 41), Uttarakhand (Bharti, 2001: 164; Ward, 2001: 649).

**Table 1. Description of the localities in Northern Shivalik where ants were sampled between 2008 and 2012**

State	Locality	Coordinates	Altitude(m)
Himachal Pradesh	*Andretta	32.0744°N 76.5856°E	940
Himachal Pradesh	*Baijnath	32.0527°N 76.6500°E	1000
Himachal Pradesh	*Bajaura	31.8467°N 77.1622°E	1100
Himachal Pradesh	*Bakhra	31.4087°N 76.4327°E	650
Himachal Pradesh	*Bari	31.6591°N 76.5000°E	520
Himachal Pradesh	*Bilaspur	31.3423°N 76.7616°E	520
Himachal Pradesh	*Chanaur	32.0545°N 75.6503°E	600
Himachal Pradesh	*Dattal	32.0433°N 76.5657°E	940
Himachal Pradesh	*Dehra	31.5799°N 76.7109°E	450
Himachal Pradesh	*Dhaliara	31.8496°N 76.1886°E	600
Himachal Pradesh	*Gagret	31.6620°N 76.0601°E	600
Himachal Pradesh	*Ghamrur	31.6620°N 76.0601°E	460
Himachal Pradesh	*Ghatti	31.9300°N 75.9302°E	425
Himachal Pradesh	*Guga	31.6864°N 76.1898°E	600
Himachal Pradesh	*Guraldhar	31.6670°N 76.4684°E	660
Himachal Pradesh	*Jassur	32.2824°N 75.8496°E	520
Himachal Pradesh	*Jogi Panga	31.5408°N 76.3161°E	600
Himachal Pradesh	*Jol	31.8932°N 75.9731°E	425
Himachal Pradesh	*Kandwal	32.2794°N 75.7771°E	480
Himachal Pradesh	*Khajjiyan	31.9349°N 75.9174°E	640
Himachal Pradesh	*Khatiar	32.0057°N 75.9388°E	560
Himachal Pradesh	*Khushinagar	32.3010°N 75.8913°E	620
Himachal Pradesh	*Kotla	31.8821°N 75.9963°E	560
Himachal Pradesh	*Lwasa	30.7394°N 77.1528°E	1200
Himachal Pradesh	*Mandi	31.7047°N 76.9374°E	800
Himachal Pradesh	*Nagabari	32.3004°N 75.8901°E	420
Himachal Pradesh	Nahan	30.5596°N 77.2960°E	880
Himachal Pradesh	*Palampur	32.1109°N 76.5430°E	1140
Himachal Pradesh	*Paonta Sahib	30.4384°N 77.6239°E	460
Himachal Pradesh	*Pong Dam	31.9710°N 75.9469°E	450
Himachal Pradesh	*Rehan	32.1657°N 75.9097°E	500
Himachal Pradesh	*Renuka	30.6083°N 77.4615°E	700
Himachal Pradesh	*Rewalsar	31.6345°N 76.8343°E	1300
Himachal Pradesh	*Siholi	31.9456°N 75.9949°E	550
Himachal Pradesh	*Suketi	31.5660°N 77.2968°E	350
Himachal Pradesh	Terrace	31.9234°N 75.9294°E	420
Himachal Pradesh	*Una	31.4685°N 76.2709°E	400
Jammu and Kashmir	*Billawar	32.6131°N 75.6038°E	840
Jammu and Kashmir	*Jasrota	32.4635°N 75.4040°E	400
Jammu and Kashmir	*Kathua	32.3753°N 75.5184°E	310
Jammu and Kashmir	*Manda	32.7496°N 74.8673°E	500
Jammu and Kashmir	*Mansar	32.6979°N 75.1489°E	690
Jammu and Kashmir	*Samba	32.5537°N 75.1317°E	390
Jammu and Kashmir	*Sukrala	32.6528°N 75.5817°E	1020



## Ants in Northwestern Shivalik

Jammu and Kashmir	*Surinsar	32.7009°N 75.1512°E	700
Jammu and Kashmir	*Udhampur	32.9141°N 75.1424°E	690
Punjab	Chohal	31.6666°N 76.0666°E	450
Punjab	*Dharampur	31.8420°N 75.9132°E	450
Punjab	Dunera	32.4443°N 75.8900°E	520
Punjab	*Jugial	32.3818°N 75.6776°E	500
Punjab	Ropar	30.9827°N 76.5286°E	400
Punjab	*Sukhna	30.7448°N 76.8255°E	252
Punjab	*Thein Dam	32.4426°N 75.7305°E	600
Uttarakhand	*Assan Barrage	30.4417°N 77.6754°E	440
Uttarakhand	*Dakpathar	30.4966°N 77.8004°E	750
Uttarakhand	Forest Research Institute	30.3416°N 77.9903°E	640
Uttarakhand	Mussoorie	30.4606°N 78.0521°E	1820
Uttarakhand	Rajaji Forest Area	30.2483°N 77.9878°E	660
Uttarakhand	*Ranger's College	30.3225°N 78.0445°E	660
Uttarakhand	*Selaqui	30.3720°N 77.8605°E	650

## Discussion

This study represents one of the most comprehensive surveys of the ant fauna ever undertaken in India, especially with regard to the variety of collecting techniques employed and the long duration of the sampling program. The paucity of such surveys is reflected in some of the key findings of this study, namely discovery of several new species, significant range extensions of taxa, and records of very rare species (Kumar, 2013; Wachkoo, 2013).

In this study, 179 species group taxa (163 species, 16 subspecies) are listed for 61 genera belonging to eight subfamilies. Many subspecies taxa occur in sympatry in the study area retaining their distinctiveness and accordingly deserve a species rank (Bharti *et al.*, 2015; Wachkoo, 2015; Wachkoo and Akbar, 2016). Species richness was highest in secondary forests, with 150 species followed by primary forests (121 species) and non forest areas (107 species). Out of the 179 taxa currently known in Northwestern Shivalik, 79 species are exclusive of Indomalayan origin, however, there is a profusion of faunal elements of other biogeographic regions. Myrmecofauna equally distributed across study area and Palearctic region are more prominent (98 species) in the study area followed by Australasian (32 species), Oceania (26 species), Malagasy (24 species), Afrotropical (22 species), Neotropical (16 species), and Nearctic (14 species). Twenty nine species recorded are endemic (16% of all species) to the study region, however, some of these might be

actually widespread in distribution due to the overall low sampling in India and surrounding regions and will most likely be collected in other parts of the world e.g., *Chrysapace costatus* (Bharti and Wachkoo, 2013), *Dilobocondyla gasteroreticulata* Bharti and Kumar, 2013 and *Ponera indica* Bharti and Wachkoo, 2012 discovered in the study area were also reported from China and northeastern India (Bharti *et al.*, 2016a; Chen *et al.*, 2016). We recorded ten introduced species in the study area, distributed in all three habitats, their presence is indicative of medium to strong habitat disturbance. The most diverse genera in terms of species and subspecies richness are *Camponotus* with 12 followed by *Lepisiota* with 11. *Pheidole* represents 10 while *Tetramorium* signify 9. *Aenictus* and *Carebara* each are represented by 8 species. *Crematogaster* and *Polyrhachis* each are represented by 7 species and subspecies (Table 2).

Thirty new species have been described from the sampled material (Table 2). Subfamilies Amblyoponinae and Leptanillinae have been reported for the first time from the study area (Bharti and Wachkoo, 2011, 2012a; Bharti and Kumar, 2012). Four genera *Chrysapace*, *Myopias*, *Ponera* and *Prionopelta* were also reported for the first time from India (Bharti and Wachkoo, 2012a, c, d, 2013a). The study indicates a number of the ant taxa in India are still awaiting identification and future collections should provide many new species records.

The overall structure of the ant community recorded in the study area is indicative of a disrupted, degraded ecosystem with high anthropogenic impact and reduced ecosystem health. The distribution of invasive species even in primary forests indicates a threat to the

natural habitats in the study region (Bharti *et al.*, 2016b). As habitat conversion in this region continues, the endemic fauna is particularly threatened and in urgent need of proper conservational efforts.

**Table 2. Ants in Northwestern Shivalik arranged by subfamily, genus and species. Endemic species are marked with #, introduced species are marked with +, while new species described from the sampled material are marked with \*. Abbreviations in ‘Distribution’ category refer to following biogeographic regions: Afr – Afrotropical, Aus – Australasia, Ind – Indomalaya, Mal – Malagasy, Nea – Nearctic, Neo – Neotropical, Oce – Oceania, Pal – Palearctic. Column ‘Habitat’ refers to habitat type at which species was recorded during this study, PF = primary forest; SF = secondary forest; NF = non forest area.**

Taxon	Authors	Distribution	Habitat (PF/SF/NF)
<b>Amblyoponinae</b>			
<i>Prionopelta kraepelini</i>	Forel, 1905	Aus, Ind, Oce	SF
*# <i>Stigmatomma boltoni</i>	(Bharti and Wachkoo, 2011)	Ind	PF, SF
<b>Dolichoderinae</b>			
<i>Chronoxenus wroughtonii</i>	(Forel, 1895)	Ind, Pal	PF, SF, NF
<i>Dolichoderus taprobanae</i>	(Smith, F., 1858)	Ind, Pal	PF, SF, NF
<i>Ochetellus glaber</i>	(Mayr, 1862)	Aus, Ind, Mal, Nea, Oce, Pal	SF
*# <i>Tapinoma himalaicum</i>	Bharti, Kumar and Dubovikoff, 2013	Ind	PF, SF, NF
<i>Tapinoma melanocephalum</i>	(Fabricius, 1793)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	PF, SF, NF
<i>Technomyrmex albipes</i>	(Smith, F., 1861)	Afr, Aus, Ind, Mal, Neo, Oce, Pal	PF, SF, NF
<i>Technomyrmex elatior</i>	Forel, 1902	Ind, Pal	PF, SF
<i>Technomyrmex rector</i>	Bolton, 2007	Ind	PF, SF, NF
<b>Dorylinae</b>			
<i>Aenictus aitkenii</i>	Forel, 1901	Ind	SF
<i>Aenictus brevicornis</i>	(Mayr, 1879)	Ind	NF
<i>Aenictus ceylonicus</i>	(Mayr, 1866)	Aus, Ind, Pal	PF, SF
<i>Aenictus doryloides</i>	Wilson, 1964	Ind	PF, SF
<i>Aenictus pachycerus</i>	(Smith, 1858)	Ind	NF
<i>Aenictus peguensis</i>	Emery, 1895	Ind	SF, NF
<i>Aenictus sagei</i>	Forel, 1901	Ind, Pal	SF, NF
*# <i>Aenictus wilsoni</i>	Bharti, Wachkoo and Kumar, 2012	Ind	SF
* <i>Chrysapace costatus</i>	(Bharti and Wachkoo, 2013)	Ind, Pal	PF
<i>Dorylus labiatus</i>	Shuckard, 1840	Ind, Pal	SF, NF
<i>Dorylus orientalis</i>	Westwood, 1835	Ind, Pal	PF, SF, NF
<i>Lioponera longitarsus</i>	Mayr, 1879	Afr, Aus, Ind, Pal	PF, SF, NF
<i>Ooceraea biroii</i>	(Forel, 1907)	Ind, Mal, Neo, Oce, Pal	PF, SF, NF
*# <i>Parasyscia browni</i>	(Bharti and Wachkoo, 2013)	Ind	PF
<b>Formicinae</b>			
<i>Acropyga acutiventris</i>	Roger, 1862	Aus, Ind, Pal	PF
<i>Camponotus compressus</i>	(Fabricius, 1787)	Ind, Pal	PF, SF, NF
<i>Camponotus himalayanus</i>	Forel, 1893	Ind	SF
<i>Camponotus horseshoetus</i>	Datta and Raychaudhuri, 1985	Ind	NF
<i>Camponotus kattensis</i>	Bingham, 1903	Ind	PF, SF
<i>Camponotus lamarckii</i>	Forel, 1892	Ind	PF, SF, NF
<i>Camponotus mitis</i>	(Smith, 1858)	Ind, Pal	PF, SF, NF



## Ants in Northwestern Shivalik

<i>Camponotus mutilarius</i>	Emery, 1893	Ind	PF, SF, NF
<i>Camponotus nirvanae</i>	Forel, 1893	Ind	PF, SF, NF
<i>Camponotus oblongus binominatus</i>	Forel, 1916	Ind	PF, SF, NF
<i>Camponotus opaciventris</i>	Mayr, 1879	Ind, Pal	PF, SF, NF
*# <i>Camponotus parabarbatus</i>	Bharti and Wachkoo, 2014	Ind	PF, SF
<i>Camponotus parius</i>	Emery, 1889	Ind, Pal	PF, SF, NF
<i>Camponotus sylvaticus basalis</i>	Smith, 1878	Ind	PF, SF, NF
<i>Cataglyphis setipes</i>	(Forel, 1894)	Ind, Pal	PF, SF, NF
<i>Lepisiota bipartita</i>	(Smith, 1861)	Ind, Mal, Pal	PF, SF, NF
<i>Lepisiota capensis</i>	(Mayr, 1862)	Afr, Ind, Mal, Pal	PF, SF, NF
<i>Lepisiota capensis lunaris</i>	(Emery, 1893)	Ind	PF, SF, NF
<i>Lepisiota frauenfeldi integra</i>	(Forel, 1894)	Ind, Pal	SF
<i>Lepisiota modesta</i>	(Forel, 1894)	Ind	SF, NF
<i>Lepisiota opaca</i>	(Forel, 1892)	Ind, Pal	SF
<i>Lepisiota opaca pulchella</i>	(Forel, 1892)	Ind, Pal	PF, SF, NF
<i>Lepisiota rothneyi</i>	(Forel, 1894)	Ind, Pal	PF
<i>Lepisiota rothneyi wroughtonii</i>	(Forel, 1902)	Ind, Pal	PF, NF
<i>Lepisiota sericea</i>	(Forel, 1892)	Ind, Pal	SF, NF
<i>Lepisiota simplex</i>	(Forel, 1892)	Afr, Ind, Pal	PF, SF
<i>Lepisiota</i> sp.		Ind	SF
<i>Nylanderia birmana</i>	(Forel, 1902)	Ind, Pal	PF, SF
*# <i>Nylanderia himalayana</i>	Wachkoo and Bharti, 2015	Ind	SF
<i>Nylanderia indica</i>	(Forel, 1894)	Ind, Pal	PF, SF
# <i>Nylanderia smythiesii</i>	(Forel, 1894)	Ind	PF, SF, NF
<i>Nylanderia taylori</i>	(Forel, 1894)	Ind, Pal	PF, SF, NF
<i>Nylanderia yerburyi</i>	(Forel, 1894)	Ind, Pal	PF
<i>Oecophylla smaragdina</i>	(Fabricius, 1775)	Aus, Ind, Oce, Pal	PF, SF, NF
+ <i>Paratrechina longicornis</i>	(Latreille, 1802)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	PF, SF, NF
<i>Plagiolepis dichroa</i>	Forel, 1902	Ind	SF, NF
<i>Plagiolepis jerdonii</i>	Forel, 1894	Ind, Pal	PF, SF, NF
<i>Plagiolepis</i> sp.		Ind	PF
<i>Polyrhachis exercita lucidiventris</i>	Forel, 1907	Ind	NF
<i>Polyrhachis exercita obtusisquama</i>	Forel, 1902	Ind	NF
<i>Polyrhachis illaudata</i>	Walker, 1859	Ind, Pal	PF, SF
<i>Polyrhachis lacteipennis</i>	Smith, 1858	Ind, Pal	PF, SF, NF
<i>Polyrhachis menelas</i>	Forel, 1904	Ind	PF, SF, NF
<i>Polyrhachis punctillata fergusonii</i>	Forel, 1902	Ind	NF
<i>Polyrhachis punctillata smythiesii</i>	Forel, 1895	Ind	SF, NF
<i>Polyrhachis tibialis caligata</i>	Emery, 1895	Ind	PF
*# <i>Prenolepis fisheri</i>	Bharti and Wachkoo, 2012	Ind	PF
<i>Prenolepis naoroji</i>	Forel, 1902	Ind, Pal	PF, SF, NF
*# <i>Pseudolasius diversus</i>	Wachkoo and Bharti, 2014	Ind	PF
*# <i>Pseudolasius polymorphicus</i>	Wachkoo and Bharti, 2014	Ind	SF
<b>Leptanillinae</b>			
*# <i>Leptanilla lamellata</i>	Bharti and Kumar, 2012	Ind	SF
<b>Myrmicinae</b>			
<i>Cardiocondyla wroughtonii</i>	(Forel, 1890)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	PF, SF, NF
<i>Carebara affinis</i>	(Jerdon, 1851)	Aus, Ind, Pal	PF, SF, NF
*# <i>Carebara carinata</i>	Bharti and Kumar, 2013	Ind	SF
*# <i>Carebara dentata</i>	Bharti and Kumar, 2013	Ind	PF, SF, NF
<i>Carebara diversa</i>	(Jerdon, 1851)	Afr, Ind, Pal	PF, SF
*# <i>Carebara hornata</i>	Bharti and Kumar, 2013	Ind	SF
*# <i>Carebara propomegata</i>	Bharti and Kumar, 2013	Ind	SF, NF

<sup>##</sup> <i>Carebara rectangulata</i>	Bharti and Kumar, 2013	Ind	SF
<sup>##</sup> <i>Carebara spinata</i>	Bharti and Kumar, 2013	Ind	PF, SF
<i>Cataulacus latus</i>	Forel, 1891	Ind	PF
<i>Cataulacus taprobanae</i>	Smith, F., 1853	Ind, Pal	PF, SF, NF
<i>Crematogaster anthracina</i>	Smith, F., 1857	Ind, Pal	PF, SF, NF
<i>Crematogaster binghamii</i>	Forel, 1904	Ind, Pal	PF, SF, NF
<i>Crematogaster biroi smythiesii</i>	Forel, 1902	Ind	PF, SF, NF
<i>Crematogaster flava</i>	Forel, 1886	Ind	PF, SF, NF
<i>Crematogaster rothneyi</i>	Mayr, 1879	Ind, Pal	PF, SF, NF
<i>Crematogaster sagei</i>	Forel, 1902	Ind, Pal	PF, SF
<i>Crematogaster subnuda</i>	Mayr, 1879	Ind, Pal	PF, SF, NF
<sup>*</sup> <i>Dilobocondyla gasteroreticulata</i>	Bharti and Kumar, 2013	Ind	PF, NF
<i>Erromyrmex latinodis</i>	(Mayr, 1872)	Afr, Ind, Mal, Pal	PF
<i>Gauromyrmex acanthinus</i>	(Karavaiev, 1935)	Ind, Pal	SF
<i>Lophomyrmex ambiguus</i>	Rigato, 1994	Ind	PF
<i>Lophomyrmex bedoti</i>	Emery, 1893	Ind, Pal	PF, SF, NF
<i>Lophomyrmex quadrispinosus</i>	(Jerdon, 1851)	Ind, Pal	PF, SF, NF
<sup>##</sup> <i>Lophomyrmex terraceensis</i>	Bharti and Kumar, 2012	Ind	PF
<i>Mayriella transfuga</i>	Baroni Urbani, 1977	Aus, Ind, Pal	PF, SF, NF
<i>Meranoplus bicolor</i>	(Guerin-Meneville, 1844)	Ind, Neo, Pal	PF, SF, NF
<i>Messor himalayanus</i>	(Forel, 1902)	Ind, Pal	SF, NF
<i>Messor instabilis</i>	(Smith, F., 1858)	Ind, Pal	PF, SF, NF
<i>Monomorium floricola</i>	(Jerdon, 1851)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	SF
<i>Monomorium indicum</i>	Forel, 1902	Ind, Oce, Pal	PF, SF, NF
<sup>+</sup> <i>Monomorium monomorium</i>	Bolton, 1987	Aus, Ind, Neo, Oce, Pal	PF, NF
<i>Monomorium orientale</i>	Mayr, 1879	Aus, Ind, Pal	PF, SF, NF
<sup>+</sup> <i>Monomorium pharaonis</i>	(Linnaeus, 1758)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	SF, NF
<i>Monomorium sagei</i>	Forel, 1902	Ind, Pal	PF, SF, NF
<i>Myrmecaria brunnea</i>	Saunders, 1842	Ind, Pal	PF, SF, NF
<i>Pheidole indica</i>	Mayr, 1879	Afr, Ind, Mal, Nea, Neo, Pal	PF, SF, NF
<i>Pheidole jucunda fossulata</i>	Forel, 1902	Ind, Pal	PF, SF
<i>Pheidole latinoda major</i>	Forel, 1885	Ind	PF, SF, NF
<i>Pheidole parva</i>	Mayr, 1865	Ind, Mal, Oce, Pal	PF, NF
<i>Pheidole pronotalis</i>	Forel, 1902	Ind	SF
<i>Pheidole sagei</i>	Forel, 1902	Ind, Pal	PF, SF
<i>Pheidole sharpi</i>	Forel, 1902	Ind	PF
<i>Pheidole smythiesii</i>	Forel, 1902	Ind, Pal	SF, NF
<i>Pheidole spathifera aspatha</i>	Forel, 1902	Ind, Pal	NF
<i>Pheidole woodmasoni</i>	Forel, 1885	Ind	PF, SF, NF
<i>Recurvidris recurvispinosa</i>	(Forel, 1890)	Ind, Pal	PF, SF, NF
<sup>+</sup> <i>Solenopsis geminata</i>	(Fabricius, 1804)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	SF
<i>Strumigenys exilirhina</i>	Bolton, 2000	Ind, Pal	PF
<sup>+</sup> <i>Strumigenys membranifera</i>	Emery, 1869	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	PF, SF
<i>Strumigenys nepalensis</i>	De Andrade, 1994	Ind, Pal	PF, SF, NF
<i>Strumigenys virgila</i>	Bolton, 2000	Ind	SF
<sup>+</sup> <i>Tetramorium bicarinatum</i>	(Nylander, 1846)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	PF, SF
<i>Tetramorium coonoorense</i>	Forel, 1902	Ind	PF
<i>Tetramorium lanuginosum</i>	Mayr, 1870	Aus, Ind, Mal, Nea, Neo, Oce, Pal	PF, SF, NF
<i>Tetramorium obesum</i>	Andre, 1887	Ind	SF
<sup>##</sup> <i>Tetramorium shivalikense</i>	Bharti and Kumar, 2012	Ind	PF, SF, NF
<sup>+</sup> <i>Tetramorium simillimum</i>	(Smith, F., 1851)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	SF
<i>Tetramorium smithi</i>	Mayr, 1879	Ind, Oce, Pal	SF, NF
<sup>+</sup> <i>Tetramorium tonganum</i>	Mayr, 1870	Aus, Ind, Oce, Pal	PF, SF, NF



## Ants in Northwestern Shivalik

<sup>**</sup> <i>Tetramorium triangulatum</i>	Bharti and Kumar, 2012	Ind	SF, NF
<i>Tetramorium walshi</i>	(Forel, 1890)	Ind, Pal	SF, NF
<i>Trichomyrmex aberrans</i>	(Forel, 1902)	Ind	PF, SF, NF
<sup>+</sup> <i>Trichomyrmex destructor</i>	(Jerdon, 1851)	Afr, Aus, Ind, Mal, Nea, Neo, Oce, Pal	PF, SF, NF
<i>Trichomyrmex glaber</i>	(André, 1883)	Ind	PF, SF, NF
<i>Trichomyrmex scabriceps</i>	(Mayr, 1879)	Ind	PF, SF, NF
<sup>**</sup> <i>Vollenhovia gasteropunctata</i>	Bharti and Kumar, 2013	Ind	SF
<b>Ponerinae</b>			
<sup>**</sup> <i>Anochetus cryptus</i>	Bharti and Wachkoo, 2013	Ind	SF, NF
<i>Anochetus graeffei</i>	Mayr, 1870	Afr, Aus, Ind, Mal, Oce, Pal	PF, SF, NF
<i>Anochetus madaraszi</i>	Mayr, 1897	Ind	SF
<i>Anochetus myops</i>	Emery, 1893	Ind, Pal	PF, SF
<i>Anochetus sedilloti</i>	Emery, 1884	Afr, Ind, Pal	SF
<sup>**</sup> <i>Anochetus validus</i>	Bharti and Wachkoo, 2013	Ind	SF, NF
<i>Bothroponera tesseronoda</i>	(Emery, 1877)	Ind	PF, SF
<i>Brachyponera jerdonii</i>	(Forel, 1900)	Ind	PF, SF, NF
<i>Brachyponera luteipes</i>	(Mayr, 1862)	Aus, Ind, Oce, Pal	PF, SF, NF
<i>Buniapone amblyops</i>	(Emery, 1887)	Ind, Pal	SF
<sup>**</sup> <i>Cryptopone subterranea</i>	Bharti and Wachkoo, 2013	Ind	SF
<sup>#</sup> <i>Ectomomyrmex striolatus</i>	(Donisthorpe, 1933)	Ind	PF, SF
<i>Harpegnathos venator</i>	(Smith, 1858)	Ind, Pal	PF, SF, NF
<i>Hypoponera assmuthi</i>	(Forel, 1905)	Ind	SF
<i>Hypoponera confinis</i>	(Roger, 1860)	Aus, Ind, Oce, Pal	PF, SF, NF
<sup>+</sup> <i>Hypoponera ragusai</i>	(Emery, 1894)	Afr, Aus, Ind, Mal, Nea, Oce, Pal	PF, SF, NF
<i>Hypoponera wroughtonii</i>	(Forel, 1900)	Ind	PF, SF, NF
<i>Leptogenys chinensis</i>	(Mayr, 1870)	Ind, Pal	SF, NF
<i>Leptogenys diminuta laeviceps</i>	(Smith, 1857)	Aus, Ind	PF, SF, NF
<i>Leptogenys hysterica</i>	Forel, 1900	Ind	PF, SF
<sup>**</sup> <i>Leptogenys lattkei</i>	Bharti and Wachkoo, 2013	Ind	SF
<i>Leptogenys lucidula</i>	Emery, 1895	Ind, Pal	PF
<sup>**</sup> <i>Leptogenys transitionis</i>	Bharti and Wachkoo, 2013	Ind	SF
<sup>**</sup> <i>Myopias shivalikensis</i>	Bharti and Wachkoo, 2012	Ind	SF
<i>Odontomachus monticola</i>	Emery, 1892	Aus, Ind, Pal	SF
<i>Odontoponera denticulata</i>	(Smith, 1858)	Ind, Pal	PF, SF, NF
<i>Parvaponera darwinii</i>	(Forel, 1893)	Afr, Aus, Ind, Mal, Pal	NF
<i>Platythyrea parallela</i>	(Smith, 1859)	Aus, Ind, Mal, Oce	PF, SF, NF
<i>Platythyrea sagei</i>	Forel, 1900	Ind	SF
<sup>*</sup> <i>Ponera indica</i>	Bharti and Wachkoo, 2012	Ind	PF, SF
<sup>**</sup> <i>Ponera taylori</i>	Bharti and Wachkoo, 2012	Ind	SF, NF
<i>Pseudoneoponera bispinosa</i>	(Smith, 1858)	Ind, Pal	PF, SF, NF
<i>Pseudoneoponera rufipes</i>	(Jerdon, 1851)	Ind, Pal	PF, SF, NF
<b>Proceratiinae</b>			
<i>Proceratium williamsi</i>	Tiwari, 2000	Ind	PF, SF
<b>Pseudomyrmecinae</b>			
<i>Tetraponera allaborans</i>	(Walker, 1859)	Aus, Ind, Pal	PF, SF, NF
<i>Tetraponera nigra</i>	(Jerdon, 1851)	Ind, Pal	PF, SF, NF
<i>Tetraponera rufonigra</i>	(Jerdon, 1851)	Afr, Ind, Mal, Pal	PF, SF, NF

## Acknowledgments

Financial assistance rendered by the Ministry of Environment and Forests, Govt. of India, New Delhi (grant no. 14/10/2007-ERS/RE) is gratefully acknowledged. We are grateful to AntWeb team ([www.antweb.org](http://www.antweb.org)), AntWiki ([www.antwiki.org](http://www.antwiki.org)) and AntMaps ([www.antmaps.org](http://www.antmaps.org)) for their tremendously useful work. The authors are sincerely thankful to Francisco Hita Garcia and Benoit Guénard for their valuable critiques.

## References

- Baroni Urbani, C. and De Andrade, M.L. 2003. The ant genus *Proceratium* in the extant and fossil record. Museo Regionale di Scienze Naturali - Torino Monographie 36: 1–492.
- Bharti, H. 2001. Check list of ants from north-west India I. Uttar Pradesh. Journal of Zoology 21(2): 163–167.
- Bharti, H. 2002a. Check list of ants from north-west India II. Journal of the Bombay Natural History Society 99(2): 341–343.
- Bharti, H. 2002b. Redescription of *Lepisiota modesta* Forel (Hymenoptera: Formicidae: Formicinae). Annals of Forestry 10(2): 356–358.
- Bharti, H. 2003. Queen of the army ant *Aenictus pachycereus* (Hymenoptera, Formicidae, Aenictinae). Sociobiology 42: 715–718.
- Bharti, H. 2008. Redescription of *Crematogaster subnuda* Mayr (Hymenoptera: Formicidae: Myrmicinae). Journal of Entomological Research 32(1): 83–88.
- Bharti, H., Akbar, S.A., Wachkoo, A.A. and Singh, J. 2015. Taxonomic studies on ant genus *Hypoponera* (Hymenoptera: Formicidae: Ponerinae) from India. Asian Myrmecology 7: 1–15.
- Bharti, H., Bharti, M. and Pfeiffer, M. 2016b. Ants as bioindicators of ecosystem health in Shivalik Mountains of Himalayas: assessment of species diversity and invasive species. Asian Myrmecology 8: 1–15.
- Bharti, H. and Gill, A. 2011. SEM studies on immature stages of *Pheidole indica* Mayr, 1879 (Hymenoptera: Formicidae) from India. Halteres 3: 38–44.
- Bharti, H., Guénard, B., Bharti, M. and Economo, E.P. 2016a. An updated checklist of the ants of India with their specific distributions in Indian states (Hymenoptera, Formicidae). ZooKeys 551: 1–83.
- Bharti, H. and Kaur, I. 2011. SEM studies on immature stages of weaver ant *Oecophylla smaragdina* (Fabricius, 1775) (Hymenoptera: Formicidae) from India. Halteres 3: 16–25.
- Bharti, H. and Kumar, R. 2012a. A new species of *Leptanilla* (Hymenoptera: Formicidae: Leptanillinae) with a key to Oriental species. Annales Zoologici 62(4): 619–625.
- Bharti, H. and Kumar, R. 2012b. *Lophomyrmex terraceensis*, a new ant species (Hymenoptera: Formicidae) in the *bedoti* group with a revised key. Journal of Asia-Pacific Entomology 15: 265–267.
- Bharti, H. and Kumar, R. 2012c. Taxonomic studies on genus *Tetramorium* Mayr (Hymenoptera, Formicidae) with report of two new species and three new records including a tramp species from India with a revised key. Zookeys 207: 11–35.
- Bharti, H. and Kumar, R. 2013a. Six new species of *Carebara* Westwood (Hymenoptera: Formicidae) with restructuring of world species groups and a key to Indian species. Journal of the Entomological Research Society 15(1): 47–67.
- Bharti, H. and Kumar, R. 2013b. Five new species of *Dilobocondyla* (Hymenoptera: Formicidae) with a revised key to the known species. Asian Myrmecology 5: 29–44.
- Bharti, H. and Kumar, R. 2013c. A new species of *Vollenhovia* (Hymenoptera, Formicidae) From India with key to known Indian species. Vestnik Zoologii 47(2): 67–69.
- Bharti, H., Kumar, R. and Dubovikoff, D.A. 2013b. A new species of the genus *Tapinoma* Foerster, 1850 (Hymenoptera: Formicidae) from India. Caucasian Entomological Bulletin 9(2): 303–304.
- Bharti, H. and Sharma, Y.P. 2009. Diversity and abundance of ants along an elevational gradient in Jammu-Kashmir Himalaya-I. Halteres 1(1): 10–24.
- Bharti, H., Sharma, Y.P., Bharti, M. and Pfeiffer, M. 2013a. Ant species richness, endemism and functional groups, along an elevational gradient in the Himalayas. Asian Myrmecology 5: 79–101.



- Bharti, H., Sharma, Y.P. and Kaur, A. 2009. Seasonal patterns of ants (Hymenoptera: Formicidae) in Punjab Shivalik. *Halteres* 1(1):36–47.
- Bharti, H. and Wachkoo, A.A. 2011. *Amblyopone boltoni*, a new ant species (Hymenoptera: Formicidae) from India. *Sociobiology* 58: 585–591.
- Bharti, H. and Wachkoo, A.A. 2012a. First record of *Prionopelta kraepelini* (Hymenoptera: Formicidae) from India, with description of male caste. *Sociobiology* 59: 815–821.
- Bharti, H. and Wachkoo, A.A. 2012b. *Prenolepis fisheri*, an intriguing new ant species, with a re-description of *Prenolepis naoroji* (Hymenoptera: Formicidae) from India. *Journal of the Entomological Research Society* 14(1): 119–126.
- Bharti, H. and Wachkoo, A.A. 2012c. First record of the genus *Myopias* (Hymenoptera, Formicidae) from India, with description of new species. *Vestnik Zoologii* 46(1):33–35.
- Bharti, H. and Wachkoo, A.A. 2012d. First verified record of genus *Ponera* (Hymenoptera: Formicidae) from India, with description of two new species. *Acta Zoologica Academiae Scientiarum Hungaricae* 58(3): 217–224.
- Bharti, H. and Wachkoo, A.A. 2013a. *Cerapachys browni* and *Cerapachys costatus*, two new rare ant species (Hymenoptera: Formicidae) from India. *Biologia* 68(6): 1189–1192.
- Bharti, H. and Wachkoo, A.A. 2013b. Two new species of trap jaw ant *Anochetus* (Hymenoptera: Formicidae), with a key to known species from India. *Journal of Asia-Pacific Entomology* 16: 137–142.
- Bharti, H. and Wachkoo, A.A. 2013c. *Cryptopone subterranea* sp. nov., a rare new cryptobiotic ant species (Hymenoptera: Formicidae) from India. *Asian Myrmecology* 5: 1–4.
- Bharti, H. and Wachkoo, A.A. 2013d. Two new species of the ant genus *Leptogenys* (Hymenoptera: Formicidae) from India, with description of a plesiomorphic ergatogyne. *Asian Myrmecology* 5: 11–19.
- Bharti, H. and Wachkoo, A.A. 2014a. A new carpenter ant, *Camponotus parabarbatus* (Hymenoptera: Formicidae) from India. *Biodiversity Data Journal* 2: e996.
- Bharti, H. and Wachkoo, A.A. 2014b. New synonymy of *Proceratium williamsi* Tiwari (Hymenoptera, Formicidae). *ZooKeys* 388: 69–72.
- Bharti, H. and Wachkoo, A.A. 2015. Neotype designation and redescription of *Camponotus horseshoetus* (Hymenoptera: Formicidae). *Acta Entomologica Musei Nationalis Pragae* 55: 381–385.
- Bharti, H. and Wachkoo, A.A. and Kumar, R. 2012. Two remarkable new species of *Aenictus* (Hymenoptera: Formicidae) from India. *Journal of Asia-Pacific Entomology* 15: 291–294.
- Blaimer, B.B. 2012. Acrobat ants go global - Origin, evolution and systematics of the genus *Crematogaster* (Hymenoptera: Formicidae). *Molecular Phylogenetics and Evolution* 65: 421–436.
- Bolton, B. 1977. The ant tribe Tetramoriini (Hymenoptera: Formicidae). The genus *Tetramorium* Mayr in the Oriental and Indo-Australian regions, and in Australia. *Bulletin of the British Museum (Natural History). Entomology* 36: 67–151.
- Bolton, B. 1992. A review of the ant genus *Recurvidris* (Hym: Formicidae), a new name for *Trigonogaster* Forel. *Psyche* 99: 35–48.
- Bolton, B. 2000. The ant tribe Dacetini. *Memoirs of the American Entomological Institute* 65: 1–1028.
- Boudinot, B.E., Wachkoo, A.A. and Bharti, H. 2016. The first ergatoid male of *Platythyrea* (Hymenoptera: Formicidae: Ponerinae), with contribution to colony labor suggested by observation and comparative morphology. *Myrmecological News* 22: 59–64.
- Brown, W.L. Jr. 1975. Contributions toward a reclassification of the Formicidae. V Ponerinae, tribes Platythyreini, Cerapachyini, Cyldromyrmecini, Acanthostichini, and Aenictogitini. *Search Agriculture* (Ithaca, New York) 5(1): 1–115.
- Burrard, S.G. and Hayden, H.H. 1980. *Geography and Geology of Himalayan Mountains and Tibet. Part I.* Delhi: Mittal Publishers, 307 pp.
- Chapman, J.W. and Capco, S.R. 1951. Check list of the ants (Hymenoptera: Formicidae)

- of Asia. Monographs of the Institute of Science and Technology (Manila) 1: 1–327.
- Chen, Z.L., Shi, F.M. and Zhou, S.Y. 2016. A new species and a new record of *Cerapachys* Smith, 1857 (Hymenoptera: Formicidae) from China. Far Eastern Entomologist 324: 1–12.
- Donisthorpe, H. 1933. Descriptions of three new species of Formicidae, and a synonymical note. Annals and Magazine of Natural History (10)11: 194–198.
- Donisthorpe, H. 1937. A new species of *Harpegnathos* Jerd., with some remarks on the genus, and other known species (Hym. Formicidae). Entomologist's Monthly Magazine 73: 196–201.
- Donisthorpe, H. 1939. The genus *Lioponera* Mayr (Formicidae, Cerapachyinae), with descriptions of two new species and an ergatandromorph. Annals and Magazine of Natural History (11)3: 252–257.
- Eguchi, K. 2004. Taxonomic revision of two wide-ranging Asian ants, *Pheidole fervens* and *P. indica* (Insecta: Hymenoptera, Formicidae), and related species. Annalen des Naturhistorischen Museums in Wien. B, Botanik, Zoologie 105: 189–209.
- Eguchi, K. 2008. A revision of Northwestern Vietnamese species of the ant genus *Pheidole* (Insecta: Hymenoptera: Formicidae: Myrmicinae). Zootaxa 1902: 1–118.
- Eguchi, K., Yamane, S. and Zho, S.Y. 2007. Taxonomic revision of the *Pheidole rinae* Emery complex. Sociobiology 50(1): 275–284.
- Emery, C. 1896. Saggio di un catalogo sistematico dei generi *Camponotus*, *Polyrhachis* e affini. Memorie della Reale Accademia delle Scienze dell'Istituto di Bologna 5: 363–382.
- Emery, C. 1910. Hymenoptera. Fam. Formicidae. Subfam. Dorylinae. Genera Insectorum 102: 1–34.
- Forel, A. 1892. Les Formicides de l'Empire des Indes et de Ceylan. Part I. Journal of the Bombay Natural History Society 7: 219–245.
- Forel, A. 1893. Les Formicides de l'Empire des Indes et de Ceylan. Part III. Journal of the Bombay Natural History Society 8: 17–36.
- Forel, A. 1894. Les Formicides de l'Empire des Indes et de Ceylan. Part IV. Journal of the Bombay Natural History Society 8: 396–420.
- Forel, A. 1895. Les Formicides de l'Empire des Indes et de Ceylan. Part V. Journal of the Bombay Natural History Society 9: 453–472.
- Forel, A. 1900a. Les Formicides de l'Empire des Indes et de Ceylan. Part VII. Journal of the Bombay Natural History Society 13: 303–332.
- Forel, A. 1900b. Les Formicides de l'Empire des Indes et de Ceylan. Part VI. Journal of the Bombay Natural History Society 13: 52–65.
- Forel, A. 1901. Les Formicides de l'Empire des Indes et de Ceylan. Part VIII. Journal of the Bombay Natural History Society 13: 462–477.
- Forel, A. 1902a. Variétés myrmécologiques. Annales de la Société Entomologique de Belgique 46: 284–296.
- Forel, A. 1902b. Myrmicinae nouveaux de l'Inde et de Ceylan. Revue Suisse de Zoologie 10: 165–249.
- Forel, A. 1902c. Les Formicides de l'Empire des Indes et de Ceylan. Part IX. Journal of the Bombay Natural History Society 14: 520–546.
- Forel, A. 1903. Les Formicides de l'Empire des Indes et de Ceylan. Part X. Journal of the Bombay Natural History Society 14: 679–715.
- Forel, A. 1906. Les fourmis de l'Himalaya. Bulletin de la Société Vaudoise des Sciences Naturelles 42: 79–94.
- Hosoishi, S. and Ogata, K. 2009. A checklist of the ant genus *Crematogaster* in Asia (Hymenoptera: Formicidae). Bulletin of the Institute of Tropical Agriculture Kyushu University 32: 43–83.
- Imai, H.T., Baroni Urbani, C., Kubota, M., Sharma, G.P., Narasimhanna, M.H., Das, B.C., Sharma, A.K., Sharma, A., Deodikar, G.B., Vaidya, V.G. and Rajasekarasetty, M.R. 1984. Karyological survey of Indian ants. Japanese Journal of Genetics 59: 1–32.
- Jaitrong, W. and Yamane, S. 2013. The *Aenictus ceylonicus* species group (Hymenoptera, Formicidae, Aenictinae) from Southeast



- Asia. Journal of Hymenoptera Research 31: 165–233.
- Jaitrong, W., Yamane, S. and Wiwatwitaya, D. 2010. The army ant *Aenictus wroughtonii* (Hymenoptera, Formicidae, Aenictinae) and related species in the Oriental region, with descriptions of two new species. Japanese Journal of Systematic Entomology 16: 33–46.
- Kumar, R. 2013. Taxonomy and species composition of Dolichoderinae, Myrmicinae and Pseudomyrmecinae (Hymenoptera: Formicidae) from North-west Shivalik, Ph.D. thesis, Department of Zoology and Environmental Sciences, Punjabi University, Patiala, 419 pp.
- Mathew, R. and Tiwari, R.N. 2000. Insecta: Hymenoptera: Formicidae. In: State Fauna Series 4: Fauna of Meghalaya, Part 7. Calcutta: Zoological Survey of India pp 251–409.
- Mukherji, D. and Ribeiro, S. 1925. On a collection of ants (Formicidae) from the Andaman Islands. Records of the Indian Museum 27: 205–209.
- Pisarski, B. 1967. Fourmis (Hymenoptera: Formicidae) d'Afghanistan récoltées par M. Dr. K. Lindberg. Annales Zoologici (Warsaw) 24: 375–425.
- Rigato, F. 1994. Revision of the myrmicine ant genus *Lophomyrmex*, with a review of its taxonomic position (Hymenoptera: Formicidae). Systematic Entomology 19: 47–60.
- Roonwal, M.L. 1976. Plant-pest status of root-eating ant, *Dorylus orientalis*, with notes on taxonomy, distribution and habits (Insecta: Hymenoptera). Journal of the Bombay Natural History Society 72: 305–313.
- Sarnat, E.M., Blanchard, B., Guénard, B., Fasi, J. and Economo, E.P. 2013. Checklist of the ants (Hymenoptera, Formicidae) of the Solomon Islands and a new survey of Makira Island. ZooKeys 257: 47–88.
- Schödl, S. 1998. Taxonomic revision of Oriental *Meranoplus* F Smith, 1853 (Insecta: Hymenoptera: Formicidae: Myrmicinae). Annalen des Naturhistorischen Museums in Wien. B, Botanik, Zoologie 100: 361–394.
- Shah, G.M., Jan, U. and Wachkoo, A.A. 2014. A checklist of Hoverflies (Diptera: Syrphidae) in the Western Himalaya, India. Acta Zoologica Academiae Scientiarum Hungaricae 60(4): 283–305.
- Shattuck, S.O. 1994. Taxonomic catalog of the ant subfamilies Aneuretinae and Dolichoderinae (Hymenoptera: Formicidae). University of California Publications in Entomology 112: i-xix, 1–241.
- Shattuck, S.O. and Barnett, N.J. 2007. Revision of the ant genus *Mayriella*. Memoirs of the American Entomological Institute 80: 437–458.
- Sheela, S.T., Narendran, C. and Tiwari, R.N. 2000. Redescription of a little known myrmicine ant *Recurvidris recurvispinosa* (Forel) (Hymenoptera: Formicidae). Records of the Zoological Survey of India 98: 93–98.
- Sidhu, G.S., Walia, C.S., Sachdev, C.B., Rana, K.P.C., Dhankar, R.P., Singh, S.P. and Velayutham, M. 2000. Fifty years of research on Sustainable Resource Management in Shivaliks. Punjab: Central Soil and Water Conservation Research and Training Institute, Research Centre, Chandigarh, 506 pp.
- Tak, N. 2009. Ants Formicidae of Rajasthan. Records of the Zoological Survey of India. Occasional Paper No. 288, iv, 46 pp.
- Tak, N. 2010. Insecta: Hymenoptera: Formicidae. Zoological Survey of India, Fauna of Ranthambore National Park, Conservation Area Series 43: 133–144.
- Tak, N. and Kazmi, S.L. 2011. On a collection of Insecta: Hymenoptera: Formicidae from Uttarakhand. Records of the Zoological Survey of India 111(2): 39–49.
- Tak, N. and Rathore, N.S. 2004. Insecta: Hymenoptera: Formicidae. State Fauna Series 8: Fauna of Gujarat. Zoological Survey of India 161–183.
- Tiwari, R.N. 1999. Taxonomic studies on ants of southern India (Insecta: Hymenoptera: Formicidae). Memoirs of the Zoological Survey of India 18(4): 1–96.
- Wachkoo, A.A. 2013. Taxonomy and species composition of Aenictinae, Cerapachyinae, Dorylinae, Formicinae and Ponerinae (Hymenoptera: Formicidae) from North-west Shivalik, Ph. D. thesis, Department of Zoology and Environmental Sciences, Punjabi University, Patiala, 481 pp.

- Wachkoo, A.A. 2015. New status of the ant *Camponotus mutilarius* Emery, 1893 stat. nov. (Hymenoptera: Formicidae). *Journal of Asia-Pacific Biodiversity* 8: 382–387.
- Wachkoo, A.A. and Akbar, S.A. 2016. First description of the sexuals of *Camponotus opaciventris* Mayr, 1879 (Hymenoptera, Formicidae), with notes on distribution in Western Himalaya. *Biodiversity Data Journal* 4: e10464.
- Wachkoo, A.A. and Bharti, H. 2014a. First description of the worker caste of *Nylanderia smythiesii* (Hymenoptera: Formicidae). *Biodiversity Data Journal* 2: e1163.
- Wachkoo, A.A. and Bharti, H. 2014b. Two new species of *Pseudolasius* (Hymenoptera: Formicidae) from India. *Sociobiology* 61(3): 274-280.
- Wachkoo, A.A. and Bharti, H. 2015a. Taxonomy and distribution of the ant *Cataglyphis setipes* (Hymenoptera: Formicidae). *Biodiversity Data Journal* 3: e4447.
- Wachkoo, A.A. and Bharti, H. 2015b. Taxonomic review of ant genus *Nylanderia* Emery, 1906 (Hymenoptera: Formicidae) in India. *Journal of Asia-Pacific Entomology* 8: 105-120.
- Wachkoo, A.A., Shah, G.M., Jan, U. and Akbar, S.A. 2017. A checklist of soldierflies (Diptera, Stratiomyidae) in India. *Journal of Asia-Pacific Biodiversity* 10: 44-54.
- Ward, P.S. 2001. Taxonomy, phylogeny and biogeography of the ant genus *Tetraponera* (Hymenoptera: Formicidae) in the Oriental and Australian regions. *Invertebrate Taxonomy* 15: 589–665.
- Wilson, E.O. 1964. The true army ants of the Indo-Australian area (Hymenoptera: Formicidae: Dorylinae). *Pacific Insects* 6: 427–483.



## On a collection of Monotomidae of the Museum für Naturkunde Berlin (Coleoptera: Cucujoidea)

T. K. Pal

*Zoological Survey of India, 'M' Block, New Alipore, Kolkata-700053, India.*

(Email: tkpal51@rediffmail.com)

### Abstract

The present paper incorporates result of the study on a small collection of monotomid beetles from Réunion Islands, Indian Ocean received from the Museum für Naturkunde Berlin, which revealed a new species: *Europs crassicornis*. The new species is described hereunder.

**Keywords:** *Coleoptera, Cucujoidea, Monotomidae, Europs, new species, Réunion Islands.*

Received: 15 September 2016; Revised: 10 August 2017; Online: 18 September 2017.

### Introduction

I worked out a collection of undetermined monotomid beetles, received from the Natural History Museum, Berlin and the result was published in 2000 (see Pal, 2000). Several specimens of Monotomidae of the above collection were retained for further examination. The result of the study on these monotomids was a new *Europs* Wollaston species. The new species is described in this paper.

### Materials and Methods

The material examined is now housed in the following institutions:

**MNHU-** Museum für Naturkunde Berlin;

**ZSI-** Zoological Survey of India, Kolkata.

### SYSTEMATIC ACCOUNT

Order COLEOPTERA

Suborder POLYPHAGA

Superfamily CUCUJOIDEA

Family MONOTOMIDAE

Genus *Europs* Wollaston, 1854

*Europs* Wollaston, 1854, *Ins. Mader.*, 149  
(Type: *Europs impressicollis* Wollaston by monotypy, designated by Sengupta, 1988).

**Diagnosis:** Narrow, elongate, dorsally depressed, sub-parallel, cuticle shiny with scanty pubescence. Head about as broad as long; eyes moderately large and tempora well developed, transverse impressed line on vertex behind eyes; 10-segmented antenna with 2-segmented club; mandible with single apical tooth; maxilla with fan-like lacinia; labrum not distinguishable. Prothorax about as broad as long, sides finely serrate, pronotum not excavate but punctate; front coxal cavities closed behind, prosternal process broader apically; mesocoxal cavities open outwardly. Elytra striate-punctate. Tarsi 5-5-4 in male and 5-5-5 in female. Intercoxal process of first abdominal ventrite moderately broad and bluntly rounded at apex, femoral lines moderately long. Aedeagus uninverted cucujoid-type, median lobe broadly elongate, tegmen forming a ring at base.

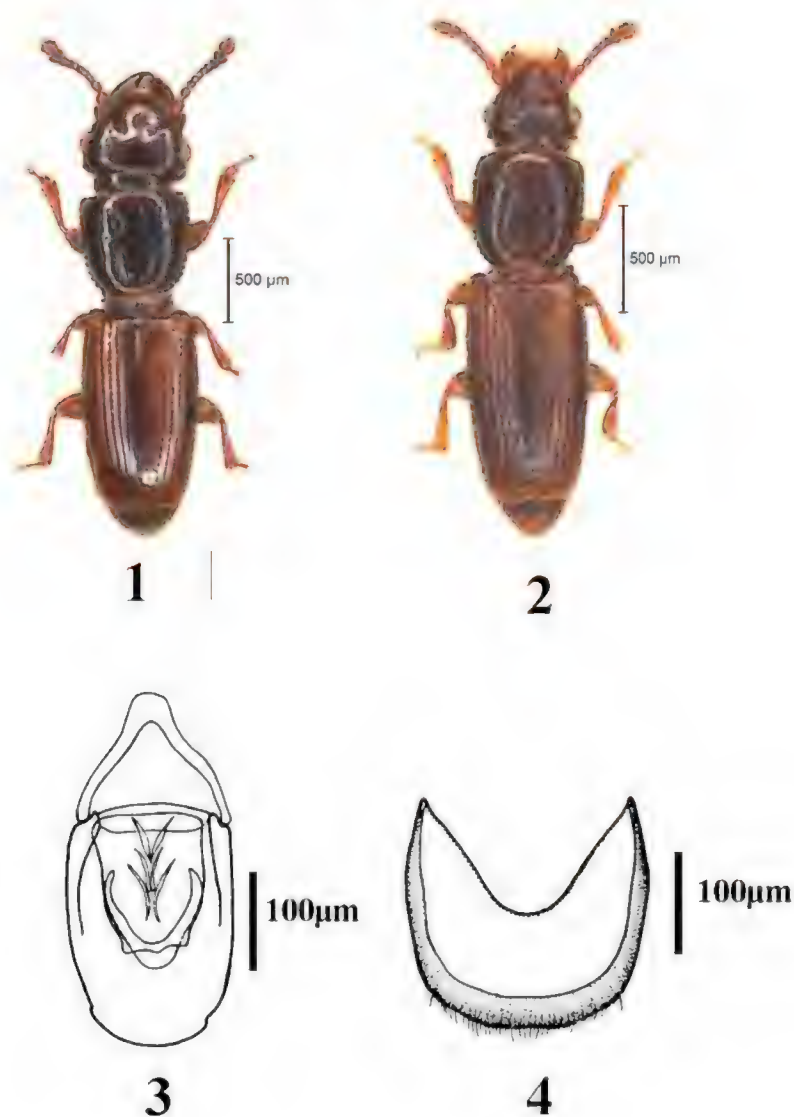
*Europs crassicornis* sp.n.

(Figs. 1-4)

[urn:lsid:zoobank.org:act:8768DAC8-2787-4D52-A344-73609E6C2B7F](https://zoobank.org/act:8768DAC8-2787-4D52-A344-73609E6C2B7F)

**General appearance** (Figs. 1, 2): elongated, moderately depressed, dark brown, elytra and legs slightly paler, dorsum almost glabrous,

punctuation of pronotum and elytra moderately coarse, pygidium strongly sclerotized.



**Figs. 1-4: *Europs crassicornis* sp. n.: 1. Male, Dorsal view; 2. Female, Dorsal view; 3. Male genitalia, Ventral view; 4. Sternite 9, Ventral view.**

**Head:** Exposed part of head broader than long, widest across eyes, somewhat narrowed from above eyes to anterior clypeal margin; eyes moderately large and about one-third as long as exposed part of head, somewhat finely faceted; tempora moderately long, at least half as long as eyes, slightly extended beneath eyes, no marked temporal scrobe; sides of head behind antennal bases with posteriorly converging linear depressions; vertex feebly convex; punctures in male moderately fine, ovoid or elliptical, separated by 2-4 diameter of punctures, frontal and clypeal parts with finer round punctures; punctures on vertex in female coarser than those in male and separated by about 1-3 diameter of punctures; devoid of pubescence. Antenna longer than exposed part of head, scape moderately large and broadly elongate, pedicel shorter and narrower than scape; segments 3-8 shorter, subequal and more or less transverse,

segments 3-8 feebly thicker anterad; segment 9 transverse, about 1.5x as wide as 8; segment 10 about as broad as long and not wider than 9.

**Prothorax:** about as broad as long or feebly transverse (1.0: 1.0-1.03), slightly wider than head (in female) to slightly narrower than head (in male), nearly parallel-sided and slightly narrowed in posterior third, sides finely serrated, pronotum moderately convex but flat on top; punctures on pronotum coarser than those on vertex of head, round to ovoid, median longitudinal part of pronotal disc impunctate and shaped like vase, punctures on sides arranged mainly in widely spaced linear rows.

**Scutellum:** moderately large, broader posteriorly and rounded apically.

**Elytra:** elongate (1.7:1.0), shorter than twice as long as prothorax and wider than it, slightly broader medially, apex of each elytron slightly rounded, moderately large punctures in 8 regular rows, punctures on stria 5 onwards slightly smaller, interstices not raised or ribbed; sutural, apical and lateral parts of elytra slightly darker than remaining areas; pygidium moderately coarsely and densely punctate, punctures elongate-ovoid.

**Male:** head slightly wider than prothorax, punctuation on vertex slightly finer than in female, sides of head beneath antennal bases well developed and form distinct antennal receptacles.

**Aedeagus** (Fig. 3): with broadly elongate median lobe having rounded apex; ventral lamina of lobe broad apically with short medial prolongation, extending not up to dorsal margin; tegmen arcuate laterally, slightly broader medially and little notched on sides above rounded apex. Sternite 9 (Fig. 4) slightly broader than long, apex nearly arcuate and sparsely setose.

**Measurements(in mm) (Holotype):** Total length including mandible 2.74, width of head across eyes 0.71, length of antenna 0.65, length and width of prothorax 0.65 and 0.67, length and width of elytra 1.24 and 0.72.

**Material examined: Holotype** ♂, Réunion, 16-19. xii.1991, Bras des Chévrettes, J. Janák lgt.,



**Paratypes:** 3 ♂♂, 8 ♀♀, data same as holotype [Holotype and 8 Paratypes in MNHU and 3 Paratypes in ZSI].

**Etymology:** Latin ‘Crassus’ and ‘Cornis’ meaning thick horns are in reference to the comparatively thicker antennae of the species.

**Remarks:** This species shows some resemblances with *Europs birmanica* Grouvelle but can be differentiated by its head and prothorax darker than elytra (vs. head, prothorax and elytra almost uniformly coloured in *birmanica*), punctures on vertex of head slightly finer and sparser, pronotal punctures on either side of median impunctate area sparse and arranged in widely spaced linear rows (vs. pronotal punctures on either side of median impunctate area more closely and densely arranged in *birmanica*), antennomeres 3-8 thicker than in *birmanica* and gradually wider anterad; lateral margins of tegmen arcuate and with a small preapical notch on either side (vs. lateral margins of tegmen sinuate in basal half and devoid of any preapical notch in *birmanica*), ventral lamina of median lobe not extended up to dorsal margin (vs. ventral lamina of median lobe extended almost up to dorsal margin in *birmanica*), sternite 9 slightly broader than long

and apical margin rather sparsely and not strongly setose (vs. sternite 9 slightly elongate, rather densely and strongly setose apical margin in *birmanica*).

#### Acknowledgements

I express my sincere gratitude to Dr. Manfred Uhlig and Dr. Johannesh Frisch of the Museum für Naturkunde Berlin for kindly allowing me to retain a part of the interesting collection of Monotomidae for study for quite sometime and for generous support. I am indebted to the Director, Zoological Survey of India, Kolkata for providing necessary facilities for the work. Ms. Jhikmik Dasgupta, ZSI, extended useful support in course of the work.

#### References

- Pal, T.K. 2000. On Five Monotomid species Deposited in the Museum of Natural History of the Humboldt-University in Berlin (Coleoptera, Cucujoidea). Mitteilungen aus dem Museum für Naturkunde in Berlin. Zoologische Reihe 76 (1): 113-119.
- Wollaston, T.V. 1854. *Insecta Maderensia; being an Account of the Insects of the Islands of the Maderian Group*. J. Van Voorst, London, 634 pp.

# A check list of Sarcophagidae (Diptera) from Algeria

Yuriy Verves

*Department of Ecological Monitoring, Institute for Evolutionary Ecology, National Academy of Sciences of Ukraine, Kyiv, Ukraine, Academician Lebedev Str. 37, Kyiv, Ukraine, 03143.*

(Email: fly\_@voliacable.com)

## Abstract

A total check list of 74 sarcophagid species known from recent Algerian territory is presented. 10 species among them have been collected in Hardaia city, including 4 species first recorded from Algeria (*Liosarcophaga ismailiana*, *Macronychia lemariei*, *Phrosinella nasuta* and *Phytosarcophaga destructor*).

**Keywords:** *Sarcophagids, checklist, Algeria.*

Received: 21 June 2017; Revised: 26 July 2017; Online: 18 September 2017.

## Introduction

Sarcophagid fauna of Algeria is poorly studied as there are no comprehensive published records from this region. The only documented records are by Séguy (1941) who compiled French sarcophagid list of 51 species, followed by Verves (1986) and Pape (1996) who listed 59 and 65 species respectively. More recently there are few contributions by Lehrer (2003) and Whitmore (2009; 2011) who reported new species and provided notes on the biology of Sarcophagidae. To compile the existing data and to provide a comprehensive documentation of Algerian sarcophagids here I present a checklist of 74 species.

## Materials and Methods

Hardaia (or Ghardaïa) city is located within the Sahara Desert in northern-central Algeria. Ghardaïa has a hot desert climate with extremely hot summers and mild winters. The region is marked by large temperature differences between day and night, and summer and winter ranging from lows of 5°C to highs of 46°C. The prevailing winds of summer are extremely hot, extremely dry and strong and those of winter are warm and dry. Sandstorms generally occur from March to May (compilation of Internet resources). 86 specimens of sarcophagids have been collected from Ghardaia garden, PT, 520m, 32°30'24"N, 3°37'43"E, 24-31.x.2015 by Mr. Baba Aissa by standard air entomological net

and were sent to me by Prof. Miroslav Barták (Czech University of Life Sciences, Praha) for study. 10 species were identified, including 4 first records from Algerian fauna (*Liosarcophaga ismailiana*, *Macronychia lemariei*, *Phrosinella nasuta* and *Phytosarcophaga destructor*). The list of 74 Algerian species of sarcophagids is presented below. Only the first published faunistic data from Algeria for each species is given. Author follows classification of Verves (1986) and Verves & Khrokalo (2006) in order of species in check list.

## Results

### Check list of Algerian Sarcophagidae

1. *Macronychia* (s. str.) *lemariei* Jacentkovský, 1941 [first record]. **Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-28.x.[20]15 (Baba Aissa coll.), 1 ♂, 2 ♀.
2. *Senotainia* (*Arrenopus*) *albifrons* (Rondani, 1859). [Séguy, 1941<sup>1</sup>]. **Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-31.x.[20]15 (Baba Aissa coll.), 1 ♀.
3. *Senotainia* (s. str.) *tricuspis* (Meigen, 1838). [Séguy, 1941].

<sup>1</sup> The data on authors and years of faunistic publications are given in square brackets.



4. *Protomiltogramma fasciata* (Meigen, 1824). [Verves, 1986].
5. *Pterella convergens* (Pandellé, 1895). [Séguy, 1941].
6. *Cylindrothecum ibericum* (Villeneuve, 1912) [Villeneuve, 1912a].
7. *Miltogramma algira* Macquart, 1843 [Macquart, 1843].
8. *Miltogramma aurifrons* Dufour, 1850 [Rohdendorf, 1930].
9. *Miltogramma germari* Meigen, 1824 [Séguy, 1941].
10. *Miltogramma oestracea* (Fallén, 1820) [Séguy, 1941].
11. *Miltogramma punctata* Meigen, 1824 [Verves, 1986].
12. *Craticulina tabaniformis* Fabricius, 1805 [Verves, 1986].
13. *Xeromyia algiralis* (Séguy, 1941) [Séguy, 1941].
14. *Xeromyia merei* (Séguy, 1941) [Séguy, 1941].
15. *Metopodia pilicornis* (Pandellé, 1895) [Séguy, 1941].
16. *Dolichotachina marginella* (Wiedemann, 1830) [Séguy, 1941].
17. *Sphecatoclea minor* Villeneuve, 1912 [Villeneuve, 1912b].
18. *Amobia oculata* (Zetterstedt, 1844) [Séguy, 1941].
19. *Amobia signata* (Meigen, 1824) [Verves, 1986].
20. *Phrosinella* (s. str.) *nasuta* (Meigen, 1824) [first record].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-31.x.[20]15 (Baba Aissa coll.), 3 ♂, 2 ♀.
21. *Hilarella stictica* (Meigen, 1924) [Séguy, 1941].
22. *Taxigramma heteroneura* (Meigen, 1830) [Séguy, 1941].
23. *Sarcotachina aegyptiaca* Villeneuve, 1910 [Séguy, 1941].
24. *Nyctia halterata* (Panzer, 1798) [Séguy, 1941].
25. *Nyctia lugubris* (Macquart, 1843) [Macquart, 1843].
26. *Blaesoxiphella brevicornis* Villeneuve, 1912 [Pape, 1996].
27. *Sarcophila meridionalis* Verves, 1982 [Verves, 1982].
28. *Wohlfahrtia bella* (Macquart, 1839) [Delassus, 1931].
29. *Wohlfahrtia brunnipalpis* (Macquart, 1851) [Austen, 1914].
30. *Wohlfahrtia erythroceras* Villeneuve, 1910 [Salem, 1938].
31. *Wohlfahrtia indigena* Villeneuve, 1928 [Villeneuve, 1928].
32. *Wohlfahrtia magnifica* (Schiner, 1862) [Cros, 1910].
33. *Wohlfahrtia trina* (Wiedemann, 1830) [Zumpt, 1972].
34. *Wohlfahrtia triquetra* Séguy, 1933 [Verves, 1985].
35. *Wohlfahrtia villeneuvei* Salem, 1938 [Salem, 1938].
36. *Wohlfahrtiodes aemulus* Séguy, 1940 [Séguy, 1940].
37. *Agriella algeriensis* (Townsend, 1918) [Townsend, 1918].
38. *Agriella rufescens* (Villeneuve, 1928) [Villeneuve, 1928].
39. *Agriella pandellei* Villeneuve, 1911 [Verves, 1985].
40. *Blaesoxipha cochlearis* (Pandellé, 1896) [Séguy, 1941].
41. *Blaesoxipha colorata* Verves, 1985 [Verves, 1985].
42. *Blaesoxipha dupuisi* Léonide et Léonide, 1973 [Lehrer, 1995].
43. *Blaesoxipha litoralis* (Villeneuve, 1911) [Séguy, 1941].
44. *Blaesoxipha redempta* (Pandellé, 1896) [Künckel, 1893].
45. *Blaesoxipha rufipes* (Macquart, 1839) [Verves, 1985].
46. *Blaesoxipha subcochlearis* Séguy, 1932 [Séguy, 1932].
47. *Blaesoxipha unguolata* (Pandellé, 1896) [Baer, 1921].
48. *Ravinia pernix* (Harris, 1780) [Séguy, 1941].
49. *Helicophagella maculata* (Meigen, 1835) [Séguy, 1941].
50. *Helicophagella melanura* (Meigen, 1826) [Verves, 1986].
51. *Phytosarcophaga* (s. str.) *destructor* (Malloch, 1929) [first record].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-31.x.[20]15 (Baba Aissa coll.), 13 ♂.
52. *Heteronychia (Asceloetis) ferox* (Villeneuve, 1908). [Whitmore, 2011].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E,

- 24-28.x.[20]15 (Baba Aissa coll.), 2 ♂.
53. *Heteronychia* (*Ctenodasypygia*) *minima* (Rondani, 1862) [Villeneuve, 1911].
54. *Heteronychia* (*Ctenodasypygia*) *penicillata* (Villeneuve, 1907) [Rohdendorf, 1937].
55. *Heteronychia* (*Ctenodasypygia*) *thirionae* (Lehrer, 1976) [Whitmore, 2009].
56. *Heteronychia* (*Ctenodasypygia*) *villeneuveana* (Enderlein, 1928) [Enderlein, 1928].
57. *Heteronychia* (s. str.) *consanguinea* (Rondani, 1860) [Séguy, 1941].
58. *Heteronychia* (s. str.) *pandellei* (Rohdendorf, 1937) [Rohdendorf, 1937].
59. *Karovia hirticrus* (Pandellé, 1896) [Böttcher, 1912].
60. *Notoecus longestylatus* (Strobl, 1906) [Rohdendorf, 1937].
61. *Krameromyia anaces* (Walker, 1849) [Verves, 1986].
62. *Myorhina* (s. str.) *nigriventris* (Meigen, 1826) [Séguy, 1941].
63. *Thyrsoctema incisilobata* (Pandellé, 1896) [Verves, 1986].
64. *Bercaea africa* (Wiedemann, 1824): [James, 1947].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-31.x.[20]15 (Baba Aissa coll.), 25 ♂.
65. *Liopygia* (*Engelisca*) *surcoufi* (Villeneuve, 1913) [Villeneuve, 1913].
66. *Liopygia* (*Jantia*) *crassipalpis* (Macquart, 1839) [Séguy, 1941].
67. *Liopygia* (*Thomsonea*) *argyrostoma* (Robineau-Desvoidy, 1830) [Rohdendorf, 1937].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-28.x.[20]15 (Baba Aissa coll.), 1 ♂.
68. *Liosarcophaga* (*Curranea*) *tibialis* (Macquart, 1851) [Séguy, 1941].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-31.x.[20]15 (Baba Aissa coll.), 12 ♂.
69. *Liosarcophaga* (s. str.) *ismailiana* Lehrer, 1998 [first record]. **Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-28.x.[20]15 (Baba Aissa coll.), 1 ♂.
70. *Liosarcophaga* (s. str.) *jacobsoni* (Rohdendorf, 1937) [Lehrer, 2003].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 5. & 24-31.x.[20]15 (Baba Aissa coll.), 13 ♂.
71. *Parasarcophaga* (s. str.) *albiceps* (Meigen, 1826) [Séguy, 1941].
72. *Parasarcophaga* (s. str.) *hirtipes* (Wiedemann, 1830) [Séguy, 1940].
73. *Sarcophaga lehmanni* Müller, 1922. [Lehrer, 2003].  
**Material examined:** Ghardaia garden, PT, 520 m, 32°30'24"N, 3°37'43"E, 24-29-31.x.[20]15 (Baba Aissa coll.), 1 ♂.
74. *Sarcophaga variegata* (Scopoli, 1763) [Séguy, 1941].

## Discussion

As detailed by Pape (1996) and Verves (1986) the sarcophagid fauna in Palaearctic north-west Africa ("Magrib") may contain not less than 250-300 species; in view of this data, it seems that the documentation of sarcophagid flies from Algeria is far from complete. It has been observed that studies on Algerian sarcophagids were mainly focused on economically important groups consisting of shizophagous larvae (numbers in present list: 23, 27-31, 33-36, 48-51, 63-68, 70-72) and obligate parasite *Wohlfahrtia magnifica* (32) but little attention has been paid to several species belonging to other trophic groups like: cleptoparasites of wasps' and bees' nests (1-2, 4-22), endoparasites of adult bees (3), orthopterans (26, 40-47), tenebrionid beetles (37-39), terrestrial gastropods (24-25, 52-62), and lumbricids (73-74).

## Acknowledgements

Author is thankful to Prof., Dr. Sci. Miroslav Barták (Department of Zoology and Fisheries, Faculty of Agrobiolgy, Food and Natural Resources, Czech University of Life Sciences, Prague, Czech Republic) for sending dry flies.

## References

Baer, W. 1921. Die Tachinen als Schmarotzer der schädlichen Insekten. Ihre Lebensweise, wirtschaftliche Bedeutung und systematische Kennzeichnung.



- Zeitschrift für angewandte Entomologie 6: 185-246.
- Böttcher, G. 1912. Die männlichen Begattungswerkzeuge bei dem Genus *Sarcophaga* Meig. und ihre Bedeutung für die Abgrenzung der Arten. Deutsche entomologische Zeitschrift 6: 705-736.
- Cros, A. 1910. Parasitisme chez l'Homme des larves de *Wohlfahrtia* (*Sarcophila*) *magnifica* Schiner. Bulletin de la Société d'histoire naturelle de Alger 1: 54-55.
- Delassus, M. 1931. Algeria: information on the last anti-locust campaign. International Bulletin of Plant Protection 6: 89-94.
- Enderlein, G. 1928. Klassifikation der Sarcophagiden. Sarcophagiden-Studien I. Archiv für klassifikatorische und phylogenetische Entomologie 1(1): 1-56.
- James, M.T. 1947. The flies that cause myiasis in man. Miscellaneous Publications of the United States Department of Agriculture (631): 1-175.
- Kühckel d'Herculais, J. 1893. Invasions des acridiens vulgo-sauterelles en Algérie, T 1, pt. 1. 592 pp. Imprimerie administrative et commerciale Girale, A. Franceschi, Algér.
- Lehrer, A.Z. 1995. Cinq nouvelles *Blaesoxipha* Loew pour la faune du continent africain, avec quelques commentaires sur les espèces paléarctiques affines (Diptera, Sarcophagidae). Beiträge zur Entomologie 45(1): 199-213.
- Lehrer, A. Z. 2003. Sarcophaginae de l'Afrique (Insecta, Diptera, Sarcophagidae). Entomologica 37: 5-528.
- Macquart, J. 1843. Diptères exotiques nouveaux ou peu connus. Tome deuxième. 3<sup>e</sup> partie. Suite à Buffon, Paris; Librairie Encyclopedique de Roret: 5-304.
- Pape, T. 1996. Catalogue of the Sarcophagidae of the world (Insecta: Diptera). Memoirs of Entomology, International. Associated Publishers 8: 1-558. Gainesville, Florida.
- Rohdendorf, B. B. 1930. 64 h. Sarcophaginae. Die Fliegen der paläarktischen Region 11(39): 1-48.
- Rohdendorf, B. B. 1937. Fam. Sarcophagidae. I. Sarcophaginae. Faune d'URSS. Insectes Diptères 19(1): i-xv, 1-501 [in Russian with German summary and French subtitle].
- Salem, H.H. 1938. A complete revision of the species of the genus *Wohlfahrtia* B. B. et. Egyptian University. Faculty of Medicine Publ. 13: 1-90.
- Séguy, E. 1932. Études sur les diptères parasites ou prédateurs des sauterelles. Encyclopédie entomologique. Série B. Mémoires et notes. II. Diptera 6: 11-40.
- Séguy, E. 1940. Diptères recueillis par M. L. Chopard de l'Alger à la Côte d'Ivoire. Annales de la Société entomologique de France 109: 109-130.
- Séguy, E. 1941. Études sur les mouches parasites. Tome 2. Calliphorines (suite), sarcophagines et rhinophorides de l'Europe occidentale et meridionale. Recherches sur la morphologie et la distribution géographique des Diptères à larves parasites. Encyclopédie entomologique Sér. A 21: 1-436.
- Townsend, C.H.T. 1918. New muscoid genera, species and synonymy (Diptera). Insector Inscitiae Menstruus (Washington, D. C.) [1918] 6(7-9): 157-182.
- Verves, Yu. G. 1982. 64h. Sarcophaginae. In: E. Lindner (Ed.). Die Fliegen der paläarktischen Region. - Stuttgart, 1982. - 11(327): 235-296.
- Verves, Yu. G. 1985. 64h. Sarcophaginae. In: E. Lindner (Ed.). Die Fliegen der paläarktischen Region 11(330): 297-400.
- Verves, Yu. G. 1986. Family Sarcophagidae. In: Á. Soós & Papp, L. (eds). Catalogue of Palaearctic Diptera. Vol. 12. Calliphoridae – Sarcophagidae: 58-193. Science Press, Budapest; Amsterdam; New York.
- Verves, Yu. G. & Khrokalo, L. A. 2006. 123. Fam. Sarcophagidae – sarcophagids. Key to the insects of Russian Far East 6(4): 64-178. Nauka, Vladivostok [in Russian].
- Villeneuve, J. 1911. Dipterologische Sammelreise nach Korsika (Dipt.). (Schluss). Tachinidae. Deutsche Entomologische Zeitschrift 2: 117-130.
- Villeneuve, J. 1912a. Sarcophagines nouveaux. Annales historico-naturelles Musei nationalis Hungarici 10: 508, 610-616.
- Villeneuve, J. 1912b. Bulletin de la Muséum nationale d'histoire naturelle 27: 505-511.
- Villeneuve, J. 1913. Diptères nouveaux. Bulletin de la Muséum nationale d'histoire naturelle 28: 415.
- Villeneuve, J. 1928. Myodaires supérieurs nouveaux (Dipt.). Bulletin et annales de la

- royale Société entomologique de Belgique 68: 47-52.
- Whitmore, D. 2009. A review of the *Sarcophaga* (*Heteronychia*) (Diptera: Sarcophagidae) of Sardinia. Zootaxa 2318: 566-588.
- Whitmore, D. 2011. New taxonomic and nomenclatural data on *Sarcophaga* (*Heteronychia*) (Diptera: Sarcophagidae), with description of six new species. Zootaxa 2778: 1-57.
- Zumt, F. 1972. Calliphoridae (Diptera Cyclorrhapha). Part IV. Sarcophaginae. Exploration du Parc National des Virunda. Mission G. F. de Witte (1933-1935) 101: 1-264.



## ***Anokha* gen. n. (Hymenoptera: Platygastroidea: Scelionidae) and two new species from India**

**\*Rajmohana K.<sup>1</sup>, Veenakumari Kamalanathan<sup>2</sup>, Bijoy C.<sup>3</sup>, Prashanth Mohanraj<sup>2</sup>, Palatty Alles Sinu<sup>4</sup> and Ranjith A.P.<sup>5</sup>**

<sup>1</sup> Zoological Survey of India, PO New Alipore, Kolkata, West Bengal-700053, India.

<sup>2</sup> National Bureau of Agricultural Insect Resources, P.B. No. 2491, Hebbal, Bengaluru, India 560024.

<sup>3</sup> Zoological Survey of India, Western Ghats Regional Centre, Calicut, Kerala-673006, India.

<sup>4</sup> Department of Animal Science, Central University of Kerala, Padannakad, P.O. 671314, Kasargod, Kerala, India.

<sup>5</sup> Insect Ecology and Ethology Laboratory, Department of Zoology, University of Calicut, Kerala, Pin: 673635, India.

(Email: mohana.skumar@gmail.com)

### **Abstract**

A new genus *Anokha* is described in the subfamily Scelioninae (Hymenoptera: Scelionidae), from India with two new species *A. anoojii* Rajmohana and Veenakumari and *A. nigra* Rajmohana. The new genus is distinguished from other Scelioninae, by the following combination of characters: closely placed large, round, setigerous tubercles separated by narrow sinuous furrows on head and mesosoma; posteriorly emarginate mesoscutellum with postero-lateral corners drawn into prominent spines. Both sexes are described and imaged. Affinities with closely resembling genera are discussed.

**Keywords:** *Anokha*, new genus, new species, Platygastroidea.

Received: 24 February 2017; Revised: 27 August 2017; Online: 18 September 2017.

### **Introduction**

The superfamily Platygastroidea with four families (McKellar and Engel, 2012), 166 genera and around 2600 species, is one of the most diverse taxa in Hymenoptera (Johnson, 2016). Several taxa at the generic and species levels have recently been described in this family from India (Rajmohana and Peter, 2012; Rajmohana, 2014; Rajmohana and Veenakumari, 2014). Another genus *Anokha* is erected with two new species *A. anoojii* Rajmohana and Veenakumari and *A. nigra* Rajmohana. Closely placed large, round, setigerous tubercles separated by narrow sinuous furrows on head and mesosoma, resemble the sculpture in the genus *Chakra* Rajmohana and Veenakumari, 2014. With a posteriorly emarginate mesoscutellum having its postero-lateral corners drawn into pointed spines, the proposed new genus is quite unique and distinct

in Scelioninae.

### **Materials and Methods**

Specimens collected using yellow pan traps (YPT), malaise traps (MT) and sweep nets (SN) mounted on point-card tips were described, measured and imaged using a Leica M205A stereomicroscope, with 1× objective and Leica DFC-500 digital camera. The holotype and paratypes of *A. anoojii* and *A. nigra* with ZSI registration numbers are deposited at the National Zoological Collection, Zoological Survey of India, Calicut (ZSI), while seven paratypes of *A. anoojii* with NBAIR registration numbers are at the National Bureau of Agricultural Insect Resources, Bengaluru (NBAIR). Morphological terminology follows Masner (1976, 1980), Austin and Field (1997) and Mikó *et al.* (2007, 2010).



All measurements are taken as per Mikó *et al.* (2010). Abbreviations used in the description of taxa are as follows: HL-Head length; HW-Head width; HH-Head height; FCI (Frontal cephalic index)=HW/HH; LCI (Lateral cephalic index)=HH/HL; A1-A12-Antennomeres 1-12 (A1=Scape, A2=Pedicel); L-Length; W-Width; H-Height; OOL-Ocellar-ocular length; POL- Posterior ocellar length; LOL-Lateral ocellar length; IOS-Interorbital space; T1-T7-Metasomal tergites 1 to 7. The width of all metasomal tergites was taken anteriorly.

## Results

***Anokha* Rajmohana & Veenakumari, gen. n.**  
(Figs 1-18)

[urn:lsid:zoobank.org:act:85CD63D9-DFE8-47C6-A141-9E1A3303F59B](http://urn:lsid:zoobank.org:act:85CD63D9-DFE8-47C6-A141-9E1A3303F59B)

**Type species:** *Anokha anoojii* Rajmohana & Veenakumari

**Derivation of genus name.** ‘*Anokha*’ in Sanskrit means unique. The gender is feminine.

## Diagnosis

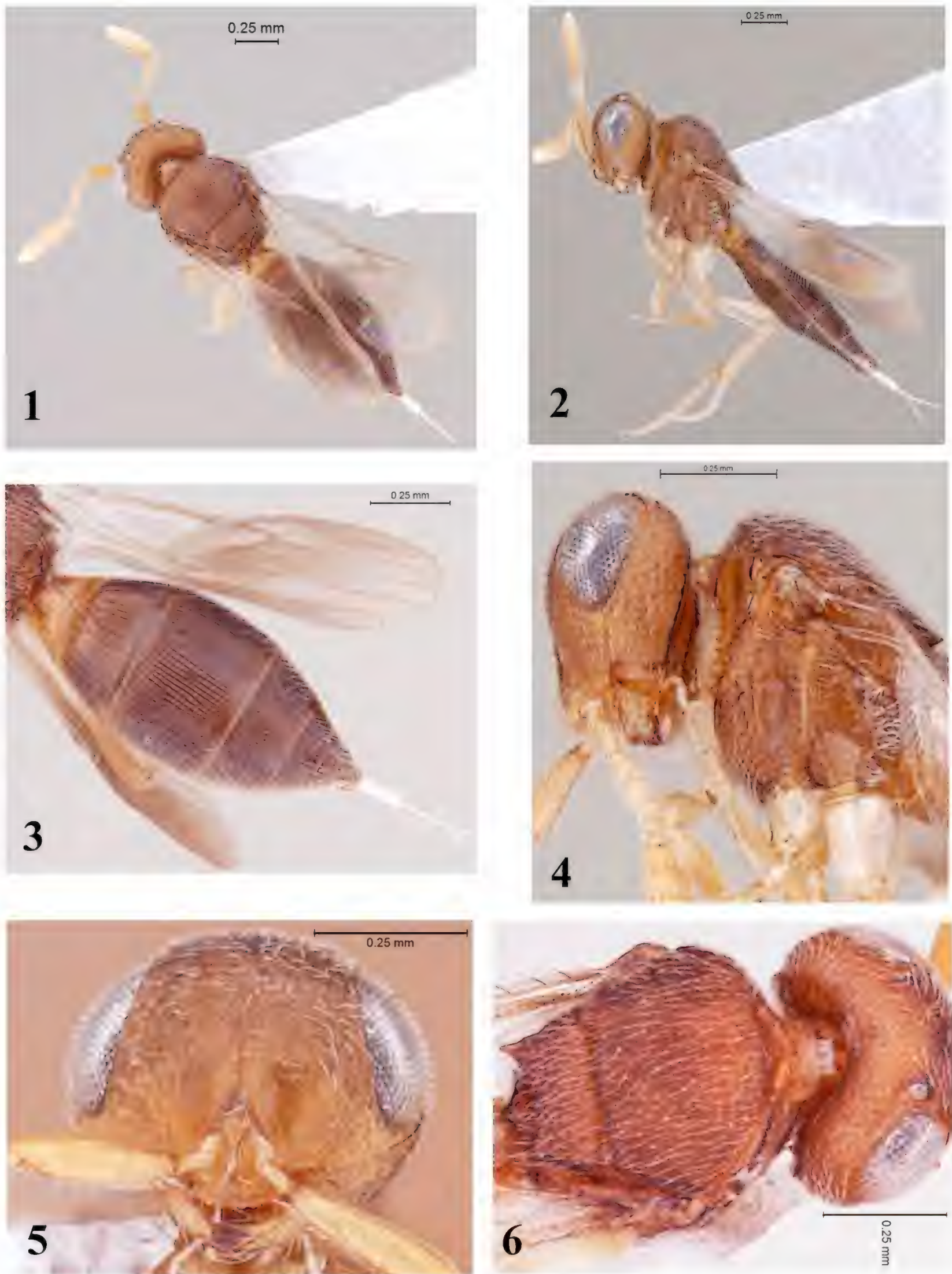
Specimens of this genus key out to *Dichoteleas* Kieffer 1907 and *Neoscelio* Dodd 1913 at couplets 51 of Masner (1976) and 40 of Galloway and Austin (1984). However, this genus has characters found in both these genera. This new genus differs from *Dichoteleas* in having densely setose eyes; in *Dichoteleas* A3 is distinctly longer than A2 and clava with seven clavomeres whereas in *Anokha* A3 shorter than A2 and clava with six clavomeres. This genus also differs from *Neoscelio* in having a distinct postmarginalis. This genus is also similar to *Chakra* in having large round setigerous tubercles on head and mesosoma. It differs from *Chakra* in having lateral ocelli closer to orbital margins than to median ocellus (OOL<LOL) and presence of spines on mesoscutellum postero-laterally.

**Description:** Body 1.78 mm (m=1.694 mm (1.31-2.134 mm), SD=0.314, n=15); moderately robust (Figs 1, 2). Head and body in various shades of pale to blackish brown. Head subellipsoidal, transverse in dorsal view; upper

frons, vertex and occiput with large, round and closely placed setigerous tubercles separated by sinuous, narrow furrows (Figs 5, 6, 11, 14); densely setose, except on lower median frons; occipital carina present, crenulate; eyes large, longer than temples, finely and densely pubescent; lateral ocelli much closer to orbital margin than to median ocellus; OOL< LOL (Figs. 11, 14); frons above toruli slightly convex and without frontal depression; interantennal process raised and with a pronounced curve; facial striae distinct; central keel present, reaching mid eye level (Figs. 5, 16); clypeus narrow, transverse, more than 3× as long as wide; mandibles short and wide, subtridentate, upper tooth longer than median and lower teeth (Fig. 8). Antenna with 12 antennomeres in both sexes; clava with 6 clavomeres (Figs. 7, 16); male antenna filiform (Fig. 10), and A5 carinate.

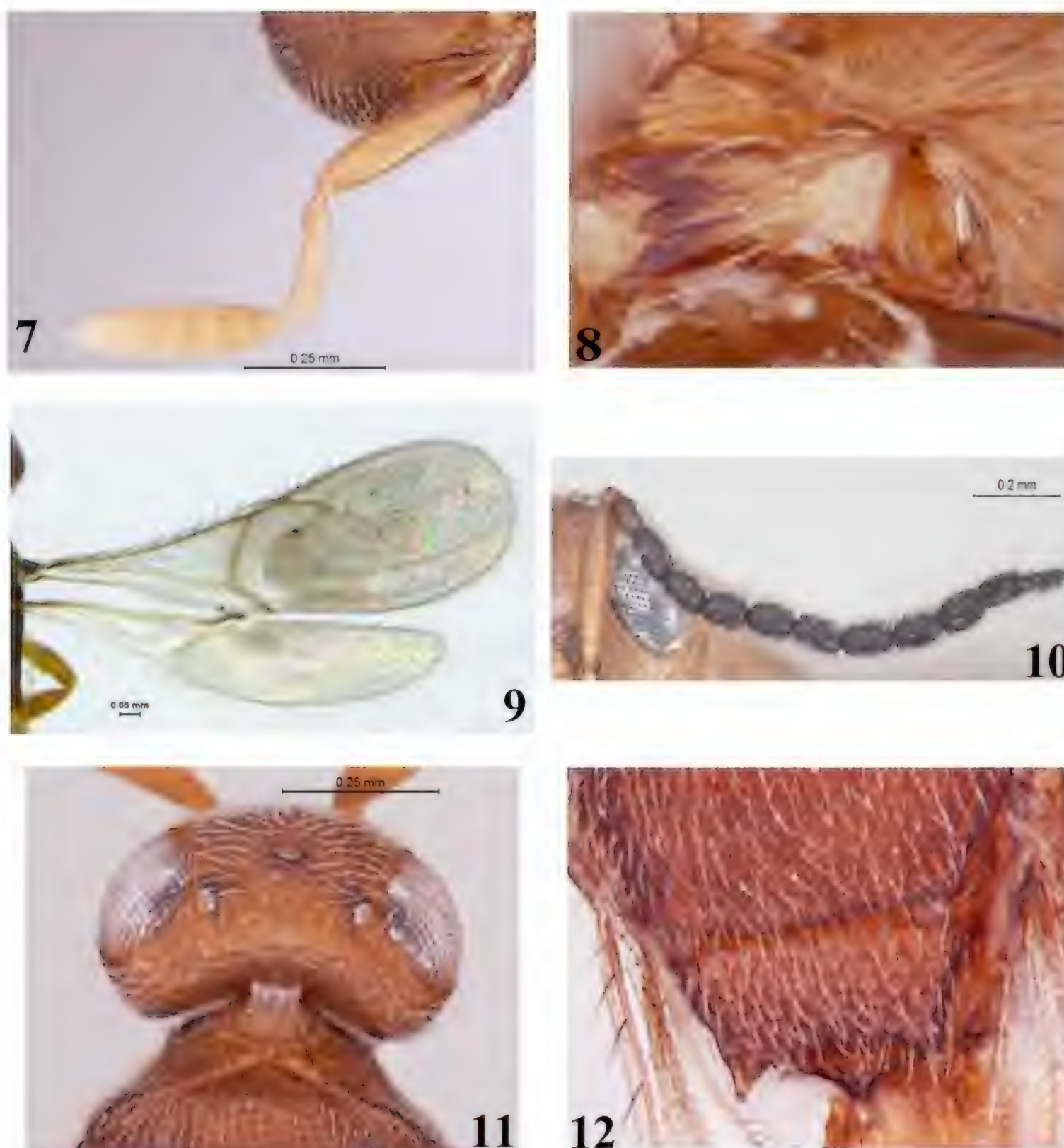
Mesosoma in dorsal view convex, longer than wide; both mesoscutum and mesoscutellum with similar sculpture as on vertex (Figs. 1, 6, 14); skaphion and notaulus absent; mesoscutellum wider than long, anterior margin crenulate, posterior margin medially emarginate, postero-lateral corners drawn into pointed spines (Figs. 6, 12, 14, 15, 17), derived entirely of mesoscutellar disc; epomial carina present; netrion almost smooth, closed near fore coxa; antero-ventral margin of lateral pronotal area with a thickened ridge; lateral pronotal area almost smooth except for a few incomplete striae on antero-ventral margin and sculpture similar to that of vertex on postero-dorsal margin; mesopleuron with three complete transverse striae beneath tegula; mesopleural depression present; mesepimeral sulcus foveate; metapleuron smooth except for posterior foveae (Fig. 4); propodeum unarmed, lateral propodeal area with large irregular foveae separated by sinuous, narrow furrows, setose laterally; lateral propodeal projections weakly acute; lateral axillar area wide; metascutellum foveate medially with a narrow metascutellar plate (Figs. 15, 17) or with a broad based triangular, medially pointed spine (Fig. 12); scutoscuteellar sulcus wide, posteriorly foveate; tibial spur formula 1:2:2. Fore wing extending beyond tip of metasoma in flexed position; fore wing submarginalis not reaching anterior margin and





Figures 1-6: *Anokha anoojii* sp.n., 1. Habitus (dorsal); 2. Habitus (lateral); 3. Metasoma; 4. Head and pleuron; 5. Frons; 6. Mesosoma (Mesoscutellum showing lateral spines)





**Figures 7-12: *Anokha anoojii* sp.n., 7. Female antenna (clava light yellow); 8. Mandible; 9. Fore and hind wings; 10. Male antenna; 11. Head showing lateral ocelli closer to orbits; 12. Mesoscutellar spines and metanotal spine**

not curved posteriorly or broken before marginalis; marginalis much shorter than stigmalis and postmarginalis; fore wing stigmalis placed at an angle of  $45^{\circ}$  from fore wing margin; medialis, basalis, discoidalis and analis indicated; medialis and basalis more strongly indicated than the other two; marginal cilia short; thick bristles present on submarginalis, marginalis and postmarginalis; hind wing with submarginalis complete (Fig. 9).

Metasoma with 7 tergites and 8 sternites, spindle shaped, with tip pointed (Figs.

3, 18); widest medially, nearly as wide as mesosoma; metasomal tergites transverse, T1 with a faint antero-medial protuberance; T3 longest and widest; laterotergites narrow; submarginal ridge well impressed; T7 in females exerted along with ovipositor, ovipositor *Scelio*-type.

**Male** (Body length=1.47 mm), similar to female except in the genitalia, number of external tergites and antennae.



*Anokha anoojii* Rajmohana & Veenakumari,  
sp. n. (Figs 1-12)

[urn:lsid:zoobank.org:act:3030F2AB-330F-46B2-AC42-BA9928765558](https://zoobank.org/urn:lsid:zoobank.org:act:3030F2AB-330F-46B2-AC42-BA9928765558)

#### Description

**Holotype:** Female. Body length=1.77mm (m=1.93 mm (1.41-2.13mm) SD=0.24, n=8).

**Color:** Yellowish brown to dark brown; basal antennomeres and legs pale; antenna yellowish brown, clava pale yellow to brownish black; region adjacent to ocelli, with dark patches; mandibles pale with teeth dark brown; wings hyaline, veins brown (Fig. 1).

**Head:** FCI=1.03; LCI=1.85; length and width of eye in ratio of 23:15.3; IOS slightly less than eye height (29:31); setigerous tubercles on frons not much pronounced as on mesosoma; interommatidial setae short, 1.7 times as long as the diameter of a single ommatidium, but only half as long as those on vertex; OOL<LOL<POL in ratio of 0.7:10.5:19.5; A2 1.25× as long as A3, nearly 1.5× as long as wide; A3–A4, A7–A12 with four rows of sensilla; clava 1.10× as long as A1; length and width of antennomeres A1–A12 in ratio of 26.6:6.2, 7.1: 3.4, 5.7: 3.4, 3.7:3.4, 2.6: 2.9, 2.1: 2.6, 3.1: 4.7, 4.8: 6.2, 4.6: 6.4, 4.6: 6.4, 4.6: 6.3, 4.8: 5.9 (Fig. 7).

**Mesosoma:** (L:W=58:55.2). Forewing (L:W=103.4:36.0) and hind wing (L:W=95:13) densely covered with microtrichia (Fig. 9); length of marginalis: stigmalis: postmarginalis of fore wing in ratio of 3.9:8.4:13.3; basal hind wing marginal cilia long, 0.57× width of wing while those towards apex are short, 0.25× width of wing.

**Metasoma:** (L:W=55.3:33.0); T1–T3 costate, costae reaching posterior margin of tergites; T2 with basal foveae; T2 posteriorly, T3 both anteriorly and posteriorly smooth; T4 onwards punctate; T2 and T3 densely setose laterally, while remaining tergites entirely covered with setae; length and width of tergites T1–T7 in ratio of 7.5:12.7, 12.0:26.4, 22.5:30.7, 10.14:28.9, 5.3:23.5, 7.0:17.1, 7.2:3.7, respectively (Fig. 3).

**Male:** Body length=1.47 mm, (n=1); color same as in females, except tip of metasoma being darker. Antenna with short brownish-white setae and sparse long white setae (Fig.10); length and width of antennomeres A1 to A12 in ratio of 36.6:6.9, 9.7:5.2, 10.8:6.2, 9.3:5.4, 10.4:5.9, 10.4:5.9, 10.9:5.8, 12.1:5.6, 11.0:6.1, 10.2:6.9, 9.8:5.9, 11.5:6.1, respectively.

**Type material:** Holotype: Female, (ZSI/WGRS/IR.INV.4291), INDIA: Kerala: Kozhikode, Kakkavayal, (11°63'38"N, 76°10'28"E), 23.xi.2011, Bijoy, C., MT. Paratypes: 1 female, (ZSI/WGRS/IR.INV.4290), Kerala: Kozhikode, Medical College Campus, (11°27'18"N, 75°83'65"E), 27.vii.2005, Rajmohan, MT; 1 male, (ZSI/WGRS/IR. INV.6554), Kerala: Trivandrum, Amburi, (8°78'63"N, 77°31'91"E), 13.xii.2015, Rajmohana, SN; 7 females, (ICAR/NBAIR/ P868, P869, P870, P871, P872, P873, P874), Kerala: Trivandrum, Pattom, (8°52'05"N 76°94'22"E) 18.vii.2015, Anooj, S.S., YPT.

**Etymology:** The species is named ‘*anoojii*’ after Anooj, S. S., Scientist, IARI, New Delhi who collected a long series of paratypes.

*Anokha nigra* Rajmohana sp. n.  
(Figs 13-18)

[urn:lsid:zoobank.org:act:25429978-3A3D-4166-A14F-0B214C20A247](https://zoobank.org/urn:lsid:zoobank.org:act:25429978-3A3D-4166-A14F-0B214C20A247)

#### Description

**Holotype:** Female. Body length=1.38 mm (m=1.424 mm (1.31-1.49 mm), SD=0.06, (n=7)).

**Color:** Honey brown; basal antennal segments and legs including coxae pale; vertex and tip of metasoma darker; antenna yellowish brown, A8–A12 brownish black dorsally and pale brown ventrally; antero-median protuberance on T1 black (Fig. 13).

**Head:** FCI=1.05; LCI=2.0; IOS 1.3× eye height; setigerous punctae on frons not much pronounced as on mesosoma; OOL and ocellar diameter subequal; OOL<LOL<POL in





Figures 13-18. *Anokha nigra* sp.n. 13. Habitus; 14. Head and mesosoma; 15. Metascutellum and anterior metasoma; 16. Antennae; 17. Close up of metanotal plate; 18. Metasoma



ratio of 7:27:52; A2 and A3 subequal in length, nearly 1.5× as long as wide; A3–A4, A7–A12 with four rows of sensilla; clava 1.3× as long as A1; length and width of antennomeres A1–A12 in ratio of 22.1:5.3, 5.0:3.7, 4.6:3.9, 3.3:3.9, 2.6:3.8, 2.1:3.8, 3.1:4.9, 4.9:6.1, 4.9:6.6, 4.4:6.6, 4.5:6.3, 4.6:4.2, respectively (Fig. 16).

**Mesosoma:** (L:W=37.8:35.8); interstices between setigerous tubercles on mesoscutellum, narrow and less granulate; metascutellum with a narrow median plate instead of spine (Figs. 15, 17). Forewing (L:W=11.2:3.1) and hind wing (L:W=7.4:1.5) with dense microtrichia; ratio of length of marginalis: stigmalis: postmarginalis of forewing in ratio of 1.2:3.6:5.0; hind wing marginal cilia 0.58× width of wing.

**Metasoma:** (L:W=90:35.5); T1–T3 costate, costae almost reaching posterior margin of tergites; T2 posteriorly and T3 both anteriorly and posteriorly smooth; T2–T5 densely setose laterally; T4–T5 smooth, devoid of any sculpture, T6 with corrugations; length and width of tergites T1–T7 in ratio 12.2:17.7, 17:32.4, 25.5:35.5, 12.8:32.2, 8.6:22.7, 9.5:12.3, 6:4.1, respectively (Fig. 18). Remaining characters as in *A. anoojii*.

**Male:** Length=1.33 mm. Color same as in females, except tip of metasoma being darker. Similar to female except in the genitalia, number of external tergites and antennae. Terminal antennal segments after A5 missing.

**Type material:** Holotype: 1 Female, (ZSI/WGRS/IR.INV6555), INDIA: Kerala: Kasargod, Kammadam, (12°31'33"N, 75°31'52"E), 29.xi.2015, Sinu, P. A., YPT. Paratypes: 5 females, (ZSI/WGRS/IR.INV6556–6660), with same data as that of holotype; 1 male and 1 female (ZSI/WGRS/IR.INV6661, 6662), Kerala: Kozhikode, Malabar Wildlife Sanctuary, (11°56'63" N, 75°96'95" E), 29.xii.2015, Ranjith, A.P., SN.

**Etymology:** The species is named '*nigra*' for its black antero-median protuberance on T1 and clavomeres A8–A12.

**Remarks:** *A. anoojii* and *A. nigra* differ in the following characters. The median metascutellar spine is distinct in *A. anoojii*, but in *A. nigra* metascutellum is represented as a narrow plate medially. T4 and T5 with numerous fine

setigerous punctae in *A. anoojii*, while it is smooth without any punctae in *A. nigra*.

## Discussion

The proposed new genus - having a well impressed submarginal ridge, antennae 12 segmented in both sexes, lateral ocelli closer to inner orbits than to median ocellus and fore wing with a distinct postmarginalis - belongs to subfamily Scelioninae as per Masner (1976).

The new genus *Anokha* is similar to the genus *Chakra*, in having large round setigerous tubercles on head and mesosoma, a median metanotal tooth (as in *A. anoojii*), short facial striae and a prominent interantennal process. However, it differs from *Chakra* in having a medially emarginate posterior margin of mesoscutellum and postero-lateral corners of mesoscutellum drawn into pointed spines. In *Chakra* the mesoscutellum is without any emargination and spines. Further the lateral ocelli are closer to inner orbits than to median ocellus in *Anokha*, while they are positioned towards median ocellus in *Chakra*. Also, the metasoma is pedunculate with T1 longer than broad in *Chakra*, while in *Anokha* the metasoma is spindle shaped, with T1 transverse. Though *Dichoteleas* has a bispinose mesoscutellum, the spines are not at the postero-lateral corners, but more lateral, nearer to tegula. The posterior margin of mesoscutellum is not emarginate either. In female *Dichoteleas*, antenna with 7 clavomeres and A3 unusually elongate. This genus also differs from *Neoscelio* in having a distinct postmarginalis. In *Neoscelio*, metascutellum with a long, thin spine which is almost equal to the length of mesoscutellum (Galloway and Austin, 1984) which is not so in *Anokha*. Moreover *Neoscelio* is restricted in its distribution to Australia.

## Acknowledgement

We are grateful to the Director, Zoological Survey of India (ZSI), Kolkata, the Officer-in-Charge, ZSI, Calicut, Kerala and the Director NBAIR, Bengaluru for providing facilities and encouragement. Thanks are also due to the Platygastroidea Planetary Biodiversity Inventory, under National Science Foundation grant No. DEB–0614764, for literature support. P.A. Sinu would like to thank the University

Grants Commission, New Delhi for a start-up grant to study the insect fauna of sacred groves of India.

## References

- Austin, A.D. and Field, S.A. 1997. The ovipositor system of scelionid and platygastid wasps (Hymenoptera: Platygastroidea): comparative morphology and phylogenetic implications. *Invertebrate Taxonomy*, 11: 1-87.
- Galloway, I.D. and Austin, A.D. 1984. Revision of the Scelioninae (Hymenoptera: Scelionidae) in Australia. *Australian Journal of Zoology*, 32(99): 1-138.
- Johnson, N.F. 2016. <http://hol.osu.edu/index.html?id=434>, [accessed on 26.1.2016]
- McKellar, R.C. and Engel, M.S. 2012. Hymenoptera in Canadian Cretaceous amber (Insecta). *Cretaceous Research* 35: 258-279.
- Masner, L. 1976. Revisionary notes and keys to world genera of Scelionidae (Hymenoptera: Proctotrupidae). *Memoirs of the Entomological Society of Canada* 100(S97): 1-87.
- Masner, L. 1980. Key to genera of Scelionidae of the Holarctic region, with descriptions of new genera and species (Hymenoptera: Proctotrupoidea). *Memoirs of the Entomological Society of Canada* 112(S113):1-54.
- Mikó, I., Masner, L. and Deans, A.R. 2010. World revision of *Xenomerus* Walker (Hymenoptera: Platygastroidea, Platygastriidae). *Zootaxa* 2708: 1-73.
- Mikó, I., Vilhelmsen, L., Johnson, N.F., Masner, L. and Péntzes, Z. 2007. Skeleto-musculature of Scelionidae (Hymenoptera: Platygastroidea) head and mesosoma. *Zootaxa* 1571: 1-78.
- Rajmohana, K. and Peter, A. 2012. On a new genus and species of Scelioninae (Hymenoptera: Platygastriidae) from India. *Biosystematica* 6(1): 19-25.
- Rajmohana, K. 2014. A systematic inventory of Scelioninae and Teleasinae (Hymenoptera: Platygastriidae) in the rice ecosystems of North central Kerala. *Memoirs of the Zoological Survey of India* 22: 1- 72.
- Rajmohana, K. and Veenakumari, K. 2014. *Chakra*, a new genus of Scelioninae (Hymenoptera: Platygastriidae) from India, along with description of a new species. *Zootaxa* 3821(2): 285-290.



## A review of the genus *Pararrhynchium* de Saussure (Hymenoptera: Vespidae: Eumeninae) from India with the description of a new species

\*P. Girish Kumar<sup>1</sup>, James M. Carpenter<sup>2</sup> and Lambert Kishore<sup>3</sup>

<sup>1</sup>Western Ghats Regional Centre, Zoological Survey of India, Kozhikode, Kerala-673006, India.

<sup>2</sup>Division of Invertebrate Zoology, American Museum of Natural History, Central Park West at 79<sup>th</sup> Street, New York, NY 10024, USA.

<sup>3</sup>P.G. & Research Department of Zoology, Malabar Christian College, Kozhikode-673001, Kerala, India.

(Email: kpgiris@gmail.com)

### Abstract

The potter wasp genus *Pararrhynchium* de Saussure, 1855, is reviewed from India. A new species, namely, *Pararrhynchium venkataramani* Girish Kumar and Carpenter sp. n. is described from north-east India. A key to species from the Indian subcontinent and an updated Oriental checklist of all known species are also provided.

**Keywords:** Vespidae, Eumeninae, *Pararrhynchium*, new species, key, checklist, India.

Received: 9 March 2017; Revised: 26 July 2017; Online: 18 September 2017.

### Introduction

De Saussure (1855) described the genus *Pararrhynchium* as a division of the genus *Rhynchium* Spinola based on the type species *Rhynchium ornatum* Smith, 1852. This genus is distributed in the Oriental and Palaearctic Regions. Eleven species with six additional subspecies are reported worldwide of which 10 species with five additional subspecies are from the Oriental Region, two species from the Indian subcontinent and one species from India (Giordani Soika, 1986b; Gusenleitner, 1998 & 2006; Nguyen, 2015). In this paper a new species, namely, *Pararrhynchium venkataramani* Girish Kumar and Carpenter sp. n. is described from north-east India. A key to species of the Indian subcontinent and an updated Oriental checklist of species are also provided.

### Materials and Methods

The adult morphological and colour characters were studied and photographed by using pinned and dried specimens under a Leica Stereo microscope with LAS software version 3.6.0. Type specimens are added to the 'National Zoological Collections' of ZSIK.

#### Abbreviations used for the Museums:

ZMB — Museum für Naturkunde, Berlin, Germany; ZSIK — Western Ghat Regional Centre, Zoological Survey of India, Kozhikode (= Calicut), India.

#### Abbreviations used for the terms:

F = Flagellar segments; H = Head; M = Mesosoma; OOL = Ocellocular distance; POL = Post ocellar distance; S = Metasomal sterna; T = Metasomal terga.

#### Genus *Pararrhynchium* de Saussure, 1855

*Pararrhynchium* de Saussure, 1855: 173, division of genus *Rhynchium* Spinola. Type species: *Rhynchium ornatum* Smith, 1852, by monotypy.

*Prorrhynchium* de Saussure, 1855: 174, division of genus *Rhynchium* Spinola. Type species: *Rhynchium smithii* de Saussure, 1855, by monotypy.

*Prorrhynchium* de Saussure, 1856: 8 (Table des Matières), 348 (Index) (incorrect spelling of *Prorrhynchium* de Saussure).

*Pararrhynchium* de Saussure, 1862: 182; Giordani Soika, 1973: 122; Giordani Soika, 1986a: 141; Giordani Soika,

1986b: 77, 79 (incorrect spelling of *Pararrhynchium* de Saussure).  
*Parrhynchium* Dalla Torre, 1894: 42 (subgenus of *Rhynchium* Spinola; incorrect spelling of *Pararrhynchium* de Saussure) [erroneously gives de Saussure, 1862, as the first reference!].

**Diagnosis:** Propodeal dorsum forming shelf-like area behind metanotum; concavity of propodeum margined by a crest, which is incised dorsally in middle; forewing with prestigma less than half as long as pterostigma; axillary fossa narrower than long, slit-like; tegula not exceeding parategula; apical antennal article of male hooked; T1 transversely carinate, at least on sides.

**Distribution:** Oriental and Palaearctic regions.

**Key to species of *Pararrhynchium* de Saussure from the Indian subcontinent**  
 (Modified from Nguyen, 2015)

1. T1 with distinct basal transverse carina..... 2  
 – T1 with partial transverse carina at base.....  
 .....*P. venkataramani* Girish Kumar & Carpenter sp. n.  
 India
2. Female clypeus wider than long.....  
 .....*P. unifasciatum* Gusenleitner  
 Sri Lanka.  
 – Female clypeus longer than wide.....  
 .....*P. paradoxum laetum* Giordani Soika  
 India

**1. *Pararrhynchium paradoxum laetum***  
**Giordani Soika, 1986**

*Pararrhynchium* [!] *paradoxum laetum*  
 Giordani Soika, 1986b: 77, 79, female -  
 “SIKKIM” (ZMB); Gusenleitner, 2006:  
 693 (India: Kalimpong, Melli Bazar,  
 Paykong).

**Diagnosis:** Female: This subspecies is distinguished from the typical form by its colour, and punctation, throughout the body, especially on the terga, which is much finer and denser.

**Colour description:** Female: Black, with antenna and legs brownish-black. Orange-ferruginous as follows: Basal band and two apical spots on clypeus; spot above

interantennal space; speck on temple; broad band on anterior area of dorsal surface of pronotum, combined with thin band along posterior edge; large mark on top of mesepisternum; tegulae; parategulae; wide band, closely interrupted in middle, on scutellum and metanotum; transverse band on T1 on its apical third; regular apical band of same width on T2; narrow and regular apical band on T3; minute specks on sides of apical margin of S2; wings moderately and evenly brown.

**Length** (H+M+T1+T2): Female, 10.5 mm.

**Male:** Unknown.

**Distribution:** India: Sikkim, West Bengal.

**Remarks:** No specimens were available for our studies; hence the description was taken from Giordani Soika (1986b).

**2. *Pararrhynchium venkataramani* Girish Kumar & Carpenter sp. n.**  
 (Figs. 1-12)

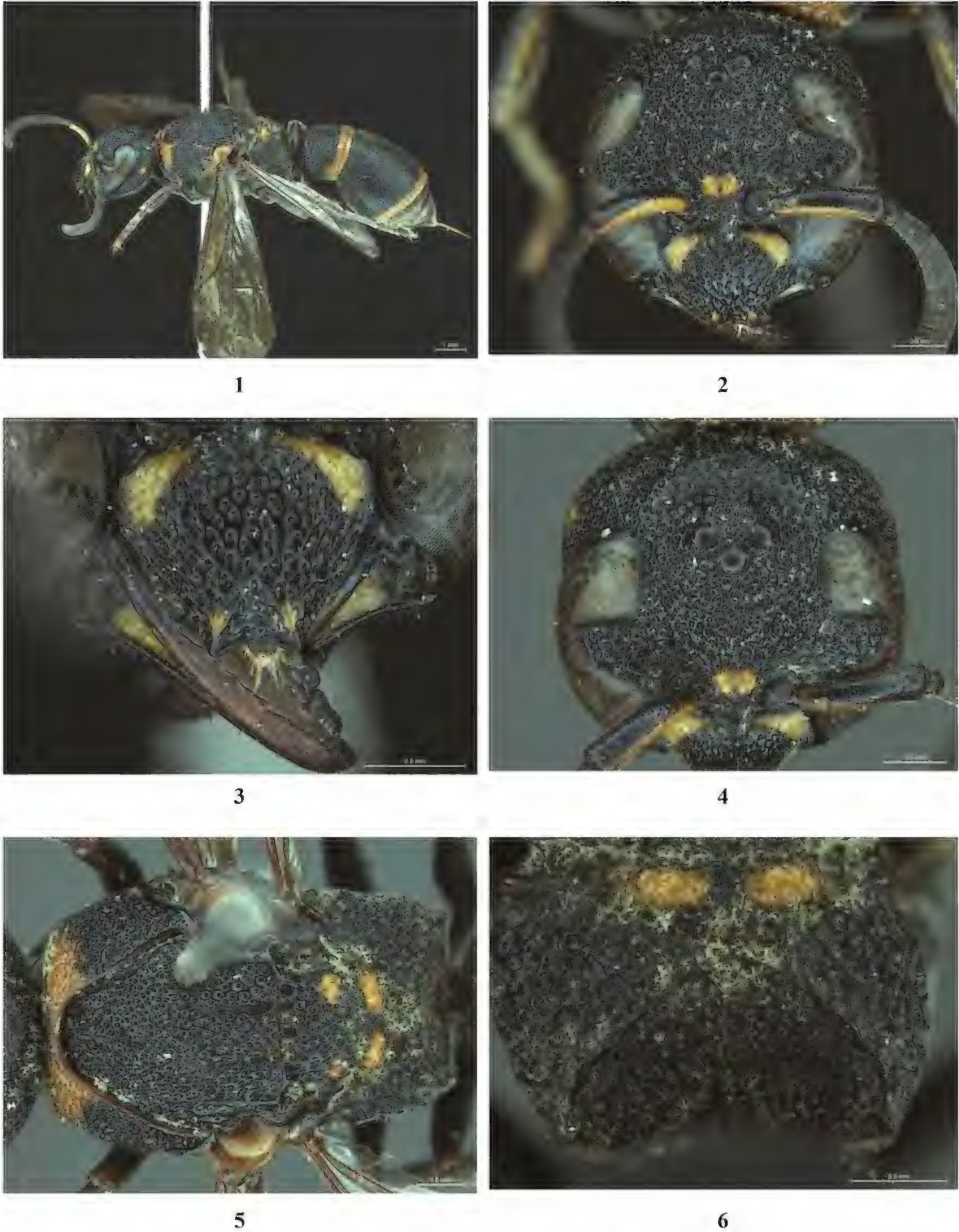
[urn:lsid:zoobank.org:act:B810184D-B5E9-42DE-A5FA-EDDB55F0CFC4](https://zoobank.org/act:B810184D-B5E9-42DE-A5FA-EDDB55F0CFC4)

**Diagnosis:** This new species can be distinguished from all other congeners by following combination of characters: epicnemial carina present; T1 with partial basal transverse carina at sides only; gena 1.22x wider than eye (measured through ocular sinus); propodeum with horizontal area shorter than (0.62x) length of metanotum, posterior surface dull, with irregular carinate striations forming punctures on its lower half; female clypeus black with yellow spots at basal and apical lateral margins.

**Description: Holotype female** (Fig. 1): **Head:** in frontal view nearly circular (Fig. 2); clypeus, in lateral view, weakly convex, in frontal view, 1.18x as wide as high (Fig. 3), with dense large punctures, apical margin deeply emarginate medially, forming sharp tooth on lateral sides, width of emargination 0.36x width of clypeus between inner eye margin; mandible with four prominent teeth, outer one bluntly pointed



Plate I



Figs. 1-6 *Pararrhynchium venkataramani* Girish Kumar & Carpenter **sp. n.** Holotype female. 1, Body profile; 2, Head frontal view; 3, Clypeus and mandible; 4, Head dorsal view; 5, Mesosoma dorsal view; 6, Propodeum.



Plate II



7



8



9



10



11



12

Figs. 7-12 *Pararrhynchium venkataramani* Girish Kumar & Carpenter **sp. n.** Figs. 7 & 8 Holotype female. 7, Apical half of forewing; 8, T1 & T2 dorsal view. Figs. 9-12 Paratype male. 9, Body profile; 10, Head frontal view; 11, Clypeus; 12. Antenna.

apically; inner eye margin, in frontal view, about 1.16x further apart from each other at vertex than at clypeus; frons densely covered

with very coarse, flat-bottomed punctures, punctures strongly raised to form reticulation; OOL 1.47x POL; gena 1.22x wider than eye



(measured through ocular sinus), strongly depressed near occipital carina; vertex (Fig. 4) strongly produced behind eye, with cephalic foveae small, with only sparse pubescence, situated close to each other with distance between foveae less than diameter of fovea; depression for cephalic foveae obsolete; two hump-like elevations with fewer punctures in between posterior ocelli and cephalic foveae; vertex and gena with punctures similar to those on frons; distance from posterior ocelli to apical margin of vertex slightly greater than 2x distance from posterior ocelli to inner eye margin. Antennal scape 3.44x as long as its maximum width; F1 1.44x as long as its width; F2 & F3 as long as wide; F4–F9 wider than long; F10 as long as basal width.

**Mesosoma:** Mesosoma (Fig. 5) 1.33x longer than wide in dorsal view; pronotal carina slightly raised, reaching ventral corner of pronotum; mesoscutum weakly convex, 1.1x longer than its maximum width; prescutal furrows deep, not reaching middle of mesoscutum; scutellum almost flattened, scuto-scutellar suture strongly depressed and crenulate; punctures of pronotum, mesoscutum, scutellum and metanotum similar to that of frons; mesepisternum with dense, coarse, well-defined punctures postero-dorsally, barely punctured anteroventrally; epicnemial carina present; dorsal metapleuron with few strong striae; ventral metapleuron with sparse shallow punctures; propodeum (Fig. 6) with horizontal area shorter than (0.62x) length of metanotum; dorsolateral area with coarse and dense punctures; posterior surface concave, dull, with irregular carinate striations forming punctures at its lower half, median carina present posteriorly; upper carina of propodeum curved with V-shaped incision in middle, both sides of incision at top forming teeth behind metanotum.

**Metasoma:** T1 narrower than T2 (Fig. 8), with partial basal transverse carina visible on lateral sides; anterior vertical surface of T1 with dense coarse punctures; dorsal face of T1 1.44x as wide as long; T2 slightly wider than long (1.03x), slightly raised apically; S2 depressed basally; metasomal punctures dense, strong; punctures on T1 coarser than punctures on T2; visible part of T3–T4 with small and shallow punctures; S2 with punctures similar to those on lateral margin of T2; T5–T6 and S5–S6 with minute punctures.

**Colour description:** Black; following parts

yellow: mark on base of mandible; spots on upper lateral corner and spots on lower lateral corner of clypeus; spot on frons; antennal scape beneath; small spot on temple; band on dorsal face of pronotum anteriorly; tegula (except inner margin brownish black); two spots on scutellum and metanotum each; small spot on mesepisternum; propodeal valvulae; apical band on T1 and T2; narrow apical band on S2 except sides. Following parts brown: mandible except basal yellow spot; parategula; apex of all femora and tibia; apical tarsomeres of all legs; narrow apical margins of T3–T5 and S3–S5; ovipositor sheath. Wings pale brown, veins and pterostigma dark brown.

**Length:** Body (H+M+T1+T2), 10.2 mm; fore wing, 9.6 mm.

**Variations:** The paratype female has the following differences from the holotype female: no hump-like elevation on vertex behind posterior ocelli; basal yellow spots fused to form band; parategula with yellow marking; yellow marking on outer side of fore tibia.

**Male** (Figs. 9): Structure as in female, but differing from latter as follows: head (Fig. 10) proportionately smaller, transverse, 1.13x as wide as high in frontal view; inner eye margins strongly convergent, 1.62x further apart from each other at vertex than at clypeus; gena narrow, in lateral view 1.03x as wide as eye (measured through ocular sinus); clypeus in frontal view (Fig. 11) slightly wider than high, apical margin deeply emarginate medially, forming sharp pointed tooth on each lateral side; antenna (Fig. 12) slightly slender than in female, apical antennal article hook-like and reaching beyond 11<sup>th</sup> segment in curved position. Colour similar to that of female except clypeus entirely yellow and tibia and tarsus of all legs with variegated yellow markings. Body length (H+M+T1+T2): 8–8.5 mm; fore wing length: 7.5–8 mm.

**Material examined:** Holotype female, INDIA: Arunachal Pradesh, Upper Siang Dist., Jengging, 5.vi.2008, Coll. G. Srinivasan, ZSIK Regd. No. ZSI/WGRS/I.R-INV.8605. Paratypes: INDIA: Arunachal Pradesh, Changlang Dist., Namdapha National Park, Gibbons Land, 1♀, 21.xii.1982, Coll. S. Biswas & Party, ZSIK Regd. No.

ZSI/WGRS/I.R-INV.8606; Meghalaya, East Garo Hills Dist., Darugiri, 2♂, 14-20.v.1979, Coll. S.B. Roy & Party, ZSIK Regd. Nos. ZSI/WGRS/I.R-INV.8607 & 8608.

**Distribution:** India: Arunachal Pradesh, Meghalaya.

**Etymology:** The species is named after Dr. K. Venkataraman, Former Director of the Zoological Survey of India and a well known marine biologist for his keen interest and encouragement in our studies.

**Discussion:** This new species comes close to the couplet number 10 of the key to world species of Nguyen (2015) but distinctly differs from *P. striatum* Nguyen, 2015 and *P. concavum* Nguyen, 2015.

#### Checklist of Oriental species of *Pararrhynchium* de Saussure

- (1). *P. concavum* Nguyen, 2015 — Vietnam.
- (2). *P. ishigakiense* (Yasumatsu, 1993) — Japan: Ryûkyû Islands.
- (3a). *P. ornatum bifasciatulum* Giordani Soika, 1986 — China.
- (3b). *P. ornatum infrenis* Giordani Soika, 1973 — China.
- (3c). *P. ornatum multifasciatum* Giordani Soika, 1986 — China.
- (3d). *P. ornatum ornatum* (Smith, 1852) — Japan; China.
- (3e). *P. ornatum sauteri* (von Schulthess, 1934) — Taiwan.
- (4a). *P. paradoxum laetum* Giordani Soika, 1986 — India: Sikkim, West Bengal.
- (4b). *P. paradoxum paradoxum* (Gussakovskii, 1932) — Russia: Siberia; Korea; China; Laos.
- (5). *P. sinense* (von Schulthess, 1913) — China; Laos.
- (6). *P. smithii* (de Saussure, 1855) — China.
- (7). *P. striatum* Nguyen, 2015 — Vietnam.
- (8). *P. taiwanum* Kim and Yamane, 2007 — Taiwan.
- (9). *P. tsunekii* Tano and Yamane, 1983 — Japan: Ryûkyû Islands.
- (10). *P. unifasciatum* Gusenleitner, 1998 — Sri Lanka.
- (11). *P. venkataramani* Girish Kumar and Carpenter **sp. n.** — India: Arunachal Pradesh, Meghalaya.

#### Acknowledgements

The authors are grateful to Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata for providing facilities and encouragements. PGK is also grateful to Dr. P.M. Sureshan, Officer-in-Charge, Western Ghats Regional Centre, Zoological Survey of India, Kozhikode for providing facilities and encouragements. LK is grateful to the Principal, Malabar Christian College, Kozhikode for providing research facilities and encouragements.

#### References

- Dalla Torre, K.W. Von. 1894. *Catalogus Hymenopterorum* 9, Vespidae (Diptera), Leipzig, 181 pp.
- Giordani Soika, A. 1973. Descrizione di nuovi Eumenidi. Notulae vespilogicae XXXV. Bollettino del Museo Civico di Storia Naturale di Venezia 24: 97-131.
- Giordani Soika, A. 1986a. Eumenidi paleartici nuovi o poco noti. Bollettino del Museo civico di storia naturale di Venezia 35: 91-162.
- Giordani Soika, A. 1986b. Notulae vespilogicae – XLVI. Nuovi Eumenidi Indomalesi. Lavori Societa Veneziana Scienze Naturali 11: 77-82.
- Griffin, F.J. 1939. On the dates of publication of de Saussure (H. de): Etudes sur la famille des Vespides 1-3. 1852-1858. Journal of the Society for the Bibliography of natural History 1: 211-212.
- Gusenleitner, J. 1998. Über Faltenwespen aus dem asiatischen Raum (Hymenoptera, Eumenidae, Masaridae). Linzer biologische Beiträge 30 (2): 503-513.
- Gusenleitner, J. 2006. Über Aufsammlungen von Faltenwespen in Indien (Hymenoptera, Vespidae). Linzer biologische Beiträge 38(1): 677-695.
- Gussakovskii, V. 1932. Verzeichnis der von Herrn Dr. Malaise im Ussuri und Kamtschatka gesammelten aculeaten Hymenoptera. Arkiv för Zoologi 24 A(10): 1-66.
- Kim, J.K. and Yamane, Sk. 2007. Description of a new species of *Pararrhynchium* Saussure (Hymenoptera, Vespidae, Eumeninae) from Taiwan with a Catalogue of the *Pararrhynchium* Species. Zootaxa 1556: 61-68.
- Nguyen, L.T.P. 2015. Two new species of the genus *Pararrhynchium* de Saussure



- (Hymenoptera: Vespidae: Eumeninae) from northern Vietnam. Zootaxa 3974(2): 170-176.
- Saussure, H.F. de 1852-1858. *Etudes sur la famille des vespides*. Vols. 1-3. Paris & Geneva: V. Masson & Cherbuliez. [See Griffin, 1939, for publication dates of specific pages.]
- Saussure, H.F. de. 1862. Sur divers Vespides Asiatiques et Africains du Musée de Leyden. Stettiner Entomologische Zeitung 23(4-6): 177-207.
- Schulthess, A. von. 1913. Vespiden aus den Stockholmer Museum. Arkiv för Zoologi 8(17): 1-23.
- Schulthess, A. von. 1934. Zur Kenntnis der Odynerusarten (Vespidae, Hym.) der japanischen Subregion (China, Japan, Formosa, Philippinen) mit besonderer Berücksichtigung der Sammlungen des Deutschen Entomologischen Instituts, Berlin-Dahlem. Arbeiten über Morphologische und Taxonomische Entomologie, Berlin-Dahlem 1: 66-75, 91-102.
- Yamane, Sk. and Tano, T. 1983. Studies on the genus *Anterhynchium* and its related genera of the Ryukyu Islands, Japan (Hymenoptera: Eumenidae). Memoirs Kagoshima University Research Center for the South Pacific 4(1): 119-132.
- Yasumatsu, K. 1933. Addition to the Hymenopterous fauna of the Ishigaki Island. Annotationes Zoologicae Japonenses 14: 259-271.

## Checklist of the ants of Mt. Hamiguitan, Mindanao Island, Philippines (Hymenoptera: Formicidae)

**\*David Emmanuel M. General<sup>1</sup> and Perry Archival C. Buenavente<sup>2</sup>**

<sup>1</sup> *University Researcher, University of the Philippines Los Baños Museum of Natural History, College, Los Baños, Laguna 4031, Philippines, and Research Associate, National Museum of the Philippines, Taft Ave., Ermita, Metro Manila 1000, Philippines.*

<sup>2</sup> *Researcher, National Museum of the Philippines, Taft Ave., Ermita, Metro Manila 1000, Philippines.*

(E-mail: [dmgeneral@up.edu.ph](mailto:dmgeneral@up.edu.ph))

### Abstract

The ant diversity of Mt. Hamiguitan, Mindanao Island, Philippines was surveyed using a variety of collection techniques in several sites. A total of 122 species belonging to 51 genera in 8 subfamilies was recorded. Fourteen species are newly recorded from the Philippines: *Acropyga* near *rubescens*, *Meranoplus malaysianus*, *Paratopula ankistra*, *Pheidole* cf. *planidorsum*, *Ph. deltea*, *Ph. near tjibodana*, *Ph. retivertex*, *Strumigenys dryas*, *S. euryale*, *S. near hispida*, *S. n.sp. HAM01*, *S. treptodens*, *Tetramorium adpressum* and *T. cf. vertigum*.

Keywords: *Philippines, invasive ants, Formicidae, Mt. Hamiguitan, pygmy forest.*

Received: 18 May 2017; Revised: 15 August 2017; Online: 18 September 2017.

### Introduction

The Philippines is an archipelago with a complex geological history (Lohman *et al.*, 2011). Large islands, such as Mindanao, may be accretions of several smaller proto-islands, according to some geological models (Hall, 2002). This geological complexity may provide a myriad of opportunities for colonization, isolation, and speciation (Clouse *et al.*, 2011; General and Alpert, 2012). It is necessary to conduct systematic surveys in many localities to capture the rich biodiversity generated by this complexity.

The Mount Hamiguitan Range Wildlife Refuge is a UNESCO World Heritage Site and home to the largest mossy-pygmy forest (~225 ha) on Mindanao Island (Amoroso and Aspiras, 2011; UNESCO, 2017). The area is protected and managed by the Department of Environment and Natural Resources. Botanical and vertebrate surveys have been conducted there (Balete *et al.*, 2008; Amoroso and Aspiras, 2011). Butterflies and dragonflies have also been surveyed (Mohagan and Treadaway, 2010; Villanueva and Mohagan, 2010). This paper reports the first

ever survey of the ants on Mt. Hamiguitan.

Biogeographical studies rely on published distributions of species. The biogeography of Philippine ants is poorly understood principally because of the dearth of published checklists of specific localities. General and Alpert (2012) provided a list of species and their island distributions, however, the scale is too coarse, considering the complex geological history of the islands. This present study contributes a small piece to the largely incomplete jigsaw puzzle of Philippine ant biogeography. The purpose of this paper is to allow the data mining methods to find this published list of species from a small corner of the Philippines.

### Materials and Methods

#### Study Site

Mount Hamiguitan Range is located in the Pujada Peninsula of southeastern Mindanao Island. The range, composed of a series of peaks of varying elevations, runs roughly north to south. We conducted our sampling on the



western and southern faces of Mt. Hamiguitan, in the Municipality of San Isidro, Davao Oriental Province. Collection of biological specimens was authorized under Republic Act 10066 Section 17, with proper coordination with, and supervision of, the Protected Area Supervisor, Region XI Office of the Department of Environment and Natural Resources.

We conducted our fieldwork in July 2016, at the start of the rainy season. For convenience of reporting, we divided the surveyed area into four zones.

Zone 1: 400 masl, N 6° 44' 5.2", E 126° 8' 34.1", disturbed second-growth forest, at or near the Mt. Hamiguitan Range Wildlife Sanctuary Research Center (RC). This zone corresponds roughly with vegetation type 1 (agro-ecosystem) of Amoroso and Aspiras (2011).

Zone 2: no elevation or GPS coordinates recorded, the well-established trail from RC to "Camp 4". This zone corresponds roughly with vegetation type 2 (dipterocarp forest) of Amoroso and Aspiras (2011).

Zone 3: 940 masl, N 6° 43' 59.4", E 126° 9' 58.1", "Camp 4" and surrounding area, second growth forest, younger trees and more disturbed habitat near the camp, less disturbed away from camp. "Camp 4", the semi-permanent campsite used by forest guards, guides, and researchers, was originally a logging camp, as attested by a large piece of abandoned machinery on the ground near the trail. This zone corresponds roughly with vegetation type 3 (montane forest) of Amoroso and Aspiras (2011).

Zone 4: 1150 masl, N 6° 43' 35.3", E 126° 10' 59", another semi-permanent "Camp 3", and surrounding area, including the pygmy forest. This zone corresponds roughly with vegetation type 5 (mossy-pygmy forest) of Amoroso and Aspiras (2011).

### Collection Methods

We collected ants using a variety of methods. We used 95% EtOH to preserve all the specimens.

In Zone 2, we simply collected opportunistically during the hours-long trek to our campsite in Zone 3. Many ant species in this report were recorded only from this zone. These collections will not be included in any future ecological analysis.

In Zones 1, 3, and 4, we applied a modified and abbreviated ALL Protocol (Agosti and Alonso, 2000), namely, Winkler extraction of ants from the leaf litter, pitfall trapping, twig and log breaking and opportunistic search through 10 sampling stations in a 100m horizontal transect. These collections will be analyzed in an ecological study (General and Buenavente, in prep.). We also opportunistically collected outside the transects within these zones, e.g. around the campsites.

Winkler extraction – we gathered leaf litter from a randomly selected 1m<sup>2</sup> area of forest floor, sifted the leaf litter in a sifting bag, and placed the siftate in a Winkler bag for 48 hours.

Pitfall trapping – at a spot diametrically opposite the leaf litter collection site, we inserted, flush to the ground, a plastic cup (70mm diameter, 85 mm depth) about half-filled with a weak soap solution (1-2 drops liquid dish detergent in 1 litre fresh water). We retrieved the trap after 24 hours to avoid maceration of the specimens. We immediately rinsed the soapy specimens in fresh water before transferring them to 95% EtOH.

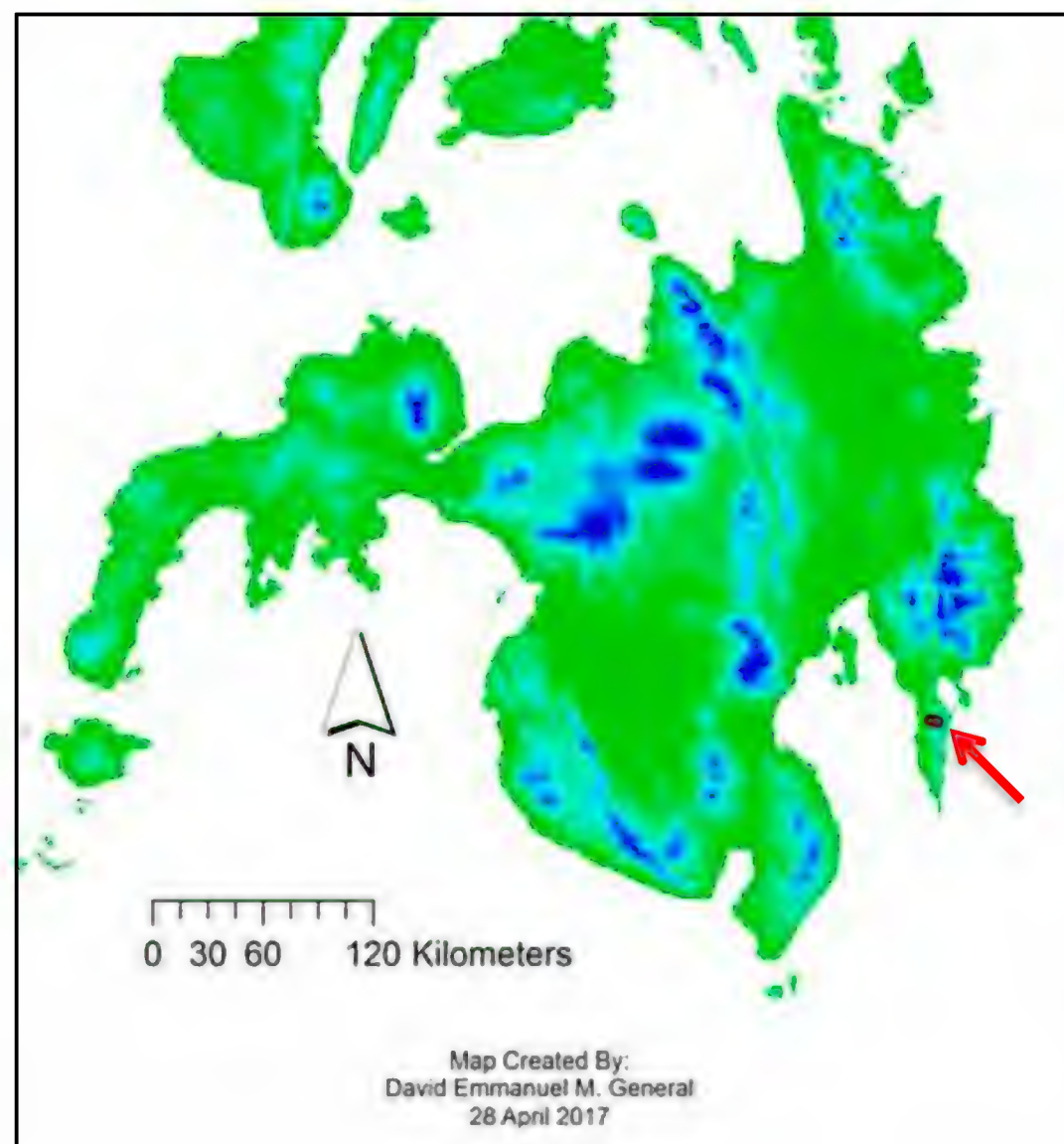
Twig and log breaking – we broke open rotten twigs and logs on the forest floor and collected those that contained ant nests. We collected the ants either by hand or by Winkler extraction after comminuting the rotten woody material.

Opportunistic search – we collected any ants we saw within the transects.

### Identification

We identified the ants first to genus using published keys (Borowiec, 2016; General and Alpert, 2012; Schmidt and Shattuck, 2014; Ward *et al.*, 2016). We then used species-level keys for individual genera: *Acropyga* (LaPolla, 2004); *Aenictus* (Jaitrong and Yamane, 2011, 2012, 2013); *Anochetus* (Brown, 1978); *Cerapachys* (Brown 1975); *Crematogaster* (Hosoishi and Ogata, 2009, 2016); *Echinopla* (Xu and Zhou, 2015); *Gnamptogenys* (Lattke, 2004); *Lioponera* (Brown, 1975); *Meranoplus* (Schödl, 1998); *Myopias* (Probst *et al.*, 2015); *Myrmoterus* (Zettel and Sorger, 2011); *Odontomachus* (Sorger and Zettel, 2011); *Paratopula* (Bolton, 1988); *Pheidole* (Eguchi, 2001); *Polyrhachis* (Dorow, 1995, Kohout, 1987, 2006, 2007, 2013, 2014); *Ponera* (Wilson, 1957, Taylor, 1967); *Pristomyrmex* (Wang,





**Figure 1. Map of Mindanao Island, red arrow indicating the location of study sites on Pujada Peninsula, in the extreme southeastern Philippines.**



**Figure 2. Map of sampling points, representing Zones 1, 3 and 4, overlaid on a topographic map (large white region is labeled “clouds”) (NAMRIA 2017)**



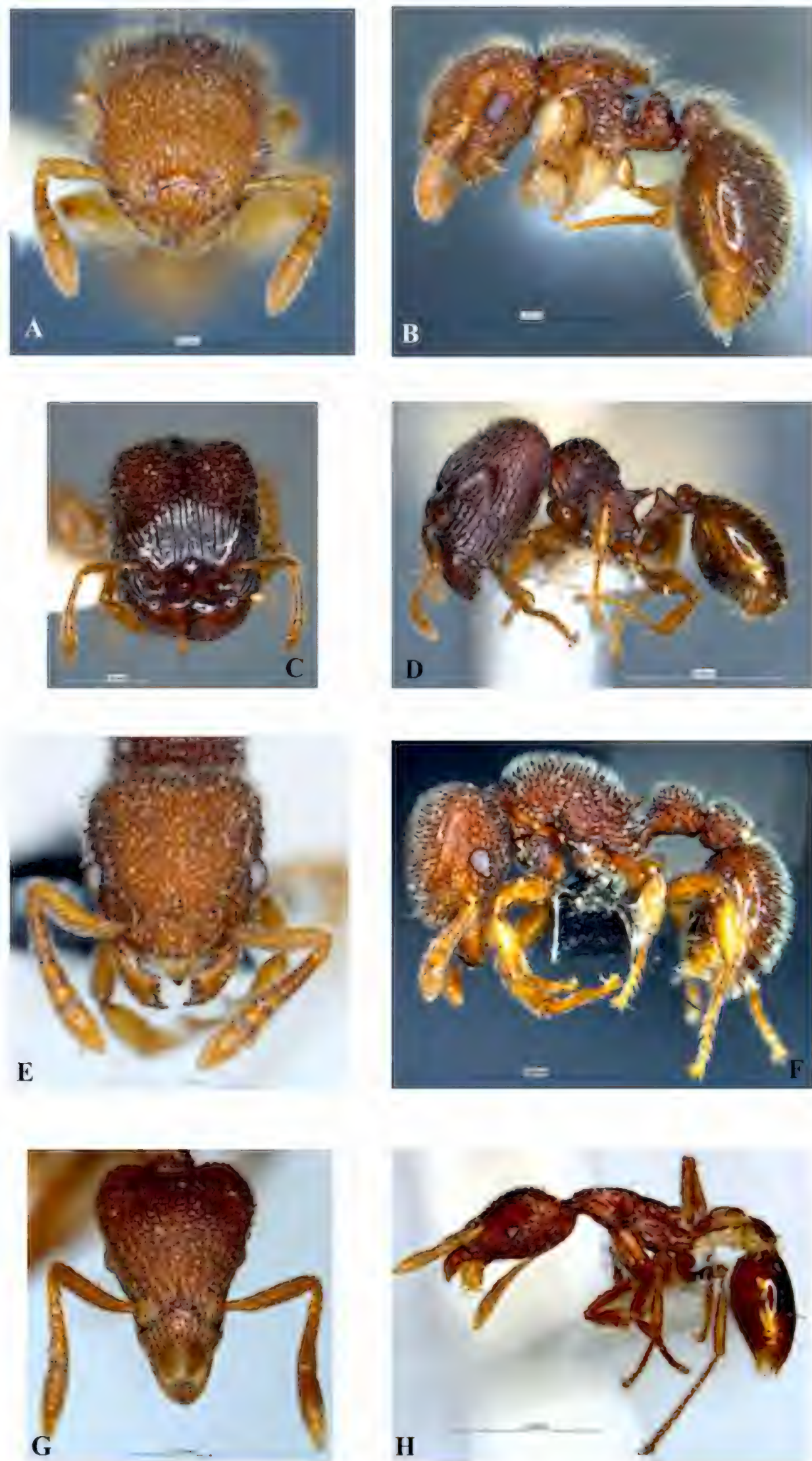


Figure 3. Some new Philippine species records from Mt. Hamiguitan, full-face view and lateral habitus. A-B: *Meranoplus malaysianus*. C-D: *Pheidole retivertex*. E-F: *Tetramorium adpressum*. G-H: *Strumigenys euryale*.

2003); *Recurvidris* (Bolton, 1992; Zettel, 2008); *Strumigenys* (Bolton, 2000); *Technomyrmex* (Bolton, 2007); *Tettheamyрма* (Bolton, 1991); *Tetramorium* (Bolton, 1976, 1977); and *Tetraponera* (Ward, 2001). We also used online resources to confirm our determinations (AntWeb, 2017, AntWiki, 2017). Finally, we also consulted with Dr. Francisco Hita Garcia regarding some problematic *Tetramorium* specimens.

All voucher specimens are deposited in the entomological collection of the National Museum of the Philippines.

## Results

We collected a total of 1,677 ants belonging to 122 species in 51 genera and 8 subfamilies. Table 1 presents the incidence of species collected by zone and collection method. We established 13 new records of species for the Philippines. Since this is the first systematic transect study of the locality, most of these records in Table 1 represent first records for Mt. Hamiguitan.

**Table 1. Checklist of ant species from Mt. Hamiguitan. Collection methods:**

**W = Winkler extraction; P = pitfall trapping; T = twig breaking; R = rotten wood breaking; O = opportunistic collecting. Refer to text for definition of zones. \* = new Philippine record of species.**

**Species codes refer to locality where the species was first recorded: APO = Mt. Apo, Mindanao Island; BUL = Mt. Bulusan, Luzon Island; HAM = Mt. Hamiguitan (this study); PH = Philippines (indeterminate, widespread); WS = Western Samar, Samar Island.**

No.	Species	Zone 1	Zone 2	Zone 3	Zone 4	# of Zones
	<b>Dolichoderinae</b>					
1	<i>Dolichoderus</i> cf. <i>affinis</i>				O	1
2	<i>Dolichoderus thoracicus</i>		O			1
3	<i>Philidris myrmecodiae</i>		O			1
4	<i>Tapinoma melanocephalum</i>	W				1
5	<i>Technomyrmex sondaicus</i>	W		W	W	3
6	<i>Technomyrmex vitiensis</i>				W	1
	<b>Dorylinae</b>					
1	<i>Aenictus gracilis</i>		O			1
2	<i>Aenictus laeviceps</i>		O			1
3	<i>Cerapachys jacobsoni</i>			O		1
4	<i>Lioponera suscitata</i>			W		1
	<b>Ectatomminae</b>					
1	<i>Gnamptogenys binghamii</i>		O	O		2
	<b>Formicinae</b>					
1	<i>Acropyga acutiventris</i>		O			1
2	<i>Acropyga</i> near <i>rubescens</i> *	W				1
3	<i>Acropyga pallida</i>			W		1
4	<i>Anoplolepis gracilipes</i>	P				1
5	<i>Camponotus</i> sp HAM01			O	O	2
6	<i>Camponotus</i> sp HAM02			O	O	2
7	<i>Colobopsis corallina</i>		O			1
8	<i>Colobopsis leonardi</i>		O			1



Checklist of the ants of Mt. Hamiguitan, Mindanao Island, Philippines (Hymenoptera: Formicidae)

9	<i>Colobopsis</i> sp APO01		O			1
10	<i>Colobopsis</i> sp HAM01	O	O			2
11	<i>Colobopsis</i> sp HAM02				O	1
12	<i>Colobopsis</i> sp HAM03	O	O			2
13	<i>Echinopla pallipes</i>				OP	1
14	<i>Lepisiota chapmani</i>		O			1
15	<i>Myrmoteras insulcatum</i>			W		1
16	<i>Myrmoteras mcarthuri</i>			W		1
17	<i>Nylanderia</i> sp HAM01	WP		W	W	3
18	<i>Paraparatrechina</i> sp HAM01			T		1
19	<i>Paraparatrechina</i> sp HAM02		O			1
20	<i>Paratrechina longicornis</i>	W	O			2
21	<i>Polyrhachis armata</i>		O		O	2
22	<i>Polyrhachis bicolor</i>		O			1
23	<i>Polyrhachis bihamata</i>	O				1
24	<i>Polyrhachis carbonaria</i>	W		O		2
25	<i>Polyrhachis</i> cf. <i>bicolor</i>		O			1
26	<i>Polyrhachis</i> cf. <i>diana</i>		O			1
27	<i>Polyrhachis inermis</i>		O			1
28	<i>Polyrhachis magnifica</i>		O	O		2
29	<i>Polyrhachis mucronata</i>	O				1
30	<i>Polyrhachis noesanensis</i>		O			1
31	<i>Polyrhachis olybria</i>		O			1
32	<i>Polyrhachis semiinermis</i>		O			1
33	<i>Polyrhachis</i> sp HAM02			T	O	2
34	<i>Polyrhachis</i> sp HAM03		O			1
35	<i>Prenolepis</i> sp HAM01				O	1
36	<i>Pseudolasius</i> sp HAM01	W		T		2
	<b>Myrmicinae</b>					
1	<i>Cardiocondyla</i> sp HAM01	W				1
2	<i>Carebara diversa</i>			P		1
3	<i>Carebara maccus</i>		O			1
4	<i>Carebara</i> sp HAM01	W		W		2
5	<i>Carebara</i> sp HAM02	W				1
6	<i>Carebara</i> sp HAM03			W		1
7	<i>Crematogaster ampullaris</i>		O			1
8	<i>Crematogaster inflata</i>		O			1
9	<i>Crematogaster philippinensis</i>	W	O	W		3
10	<i>Crematogaster</i> sp HAM01			O	WP	2
11	<i>Crematogaster</i> sp HAM02			O		1
12	<i>Crematogaster</i> sp HAM03		O			1

13	<i>Crematogaster</i> sp HAM04		O			1
14	<i>Crematogaster</i> sp HAM05				O	1
15	<i>Crematogaster</i> sp HAM06		O			1
16	<i>Eurhopalothrix philippina</i>	W		W		2
17	<i>Meranoplus malaysianus</i> *	P		W		2
18	<i>Monomorium</i> sp HAM01	W				1
19	<i>Monomorium</i> sp HAM02	P				1
20	<i>Myrmecina</i> sp HAM01	WP		W		2
21	<i>Myrmecaria brunnea</i>	O	O		O	3
22	<i>Paratopula ankistra</i> *	O				1
23	<i>Pheidole aglae</i>		O	WP	WP	3
24	<i>Pheidole</i> cf. <i>butteli</i>				W	1
25	<i>Pheidole</i> cf. <i>plagiaria</i>		O			1
26	<i>Pheidole</i> cf. <i>planidorsum</i> *				W	1
27	<i>Pheidole clypeocornis</i>	W				1
28	<i>Pheidole deltea</i> *	P			P	2
29	<i>Pheidole kikutai</i>			W	W	2
30	<i>Pheidole</i> near <i>tjibodana</i> *	W				1
31	<i>Pheidole quadricuspis</i>	P		PT	O	3
32	<i>Pheidole retivertex</i> *	W				1
33	<i>Pheidole sarawakana</i>			W	W	2
34	<i>Pheidole singaporensis</i>		O			1
35	<i>Pristomyrmex curvulus</i>			OT		1
36	<i>Recurvidris</i> sp HAM01			O		1
37	<i>Rhopalomastix</i> sp HAM01		O			1
38	<i>Solenopsis geminata</i>	WPO				1
39	<i>Solenopsis</i> sp HAM01	W				1
40	<i>Strumigenys arrogancia</i>	W				1
41	<i>Strumigenys chapmani</i>	W			W	2
42	<i>Strumigenys dryas</i> *	W				1
43	<i>Strumigenys euryale</i> *			W		1
44	<i>Strumigenys koningsbergeri</i>	W		W		2
45	<i>Strumigenys mitis</i>	W				1
46	<i>Strumigenys</i> near <i>hispida</i> *	W		W	W	3
47	<i>Strumigenys serradens</i>			W		1
48	<i>Strumigenys</i> sp HAM01*	W				1
49	<i>Strumigenys treptodens</i> *				W	1
50	<i>Syllophopsis</i> sp HAM01	W			W	2
51	<i>Tetheamyрма</i> sp PH01	W		W		2
52	<i>Tetramorium adpressum</i> *	WP				1
53	<i>Tetramorium bicarinatum</i>	O				1



**Checklist of the ants of Mt. Hamiguitan, Mindanao Island, Philippines (Hymenoptera: Formicidae)**

54	<i>Tetramorium</i> cf. <i>vertigum</i> *			W		1
55	<i>Tetramorium eleates</i>			W		1
56	<i>Tetramorium khnum</i>			WP		1
57	<i>Tetramorium pacificum</i>		O	O		2
58	<i>Vollenhovia</i> sp HAM01			W		1
	<b>Ponerinae</b>					
1	<i>Anochetus princeps</i>			T		1
2	<i>Brachyponera</i> sp HAM01	W		W		2
3	<i>Brachyponera</i> sp HAM02			WTO		1
4	<i>Brachyponera</i> sp WS02	W		W	WP	3
5	<i>Cryptopone testacea</i>			T		1
6	<i>Diacamma rugosum</i>		O	WPO	O	3
7	<i>Hypoponera</i> sp HAM01	W		WT	W	3
8	<i>Hypoponera</i> sp HAM02			W		1
9	<i>Leptogenys chinensis</i>			P		1
10	<i>Leptogenys diminuta</i>		O			1
11	<i>Myopias lobosa</i>			T		1
12	<i>Odontomachus infandus</i>	W	O			2
13	<i>Odontomachus simillimus</i>	W				1
14	<i>Ponera</i> sp HAM01	W		WO	W	3
15	<i>Ponera</i> sp HAM02			W		1
	<b>Proceratiinae</b>					
1	<i>Discothyrea</i> sp HAM01	W				1
	<b>Pseudomyrmecinae</b>					
1	<i>Tetraponera extenuata</i>	T	O			2
	Species Count	49	43	52	29	

## Discussion

Mt. Hamiguitan seems to harbor a high diversity of ants, including thirty species that were collected only along the established trail, namely Zone 2, in this study.

Some invasive ants were recorded, mainly in the more disturbed area of Zone 1, which includes the Visitor Center that receives the bulk of visitors and tourists and is partly agricultural. However, we also found a thriving twig nest of *Tetramorium pacificum* in Zone 3, perhaps attesting to the previous history of the area as a logging camp.

Mt. Hamiguitan is currently closed to hikers and mountaineers but is open to authorized academic researchers. In addition, forest guards continuously monitor unauthorized entry into the protected area while apprehended

poachers of timber and wildlife are actively prosecuted by the park management. This strict control of visitors should be maintained to allow the different forest types to continue recovery from human-mediated disturbances. More surveys need to be conducted, perhaps on other sides of Mt. Hamiguitan, since this present study was conducted only on the regular trails of the mountain range.

The survey of ants in the Philippines must proceed piecemeal, depending on the availability of scarce funding and opportunity. The archipelago is very large and there are many islands, mountains, and forests that have never been sampled for ants. This present contribution is the first in a series of ant species lists for particularly interesting or important localities in the Philippines.

## Acknowledgments

We are grateful to the following institutions for providing funding for fieldwork: United Nations Environment Program – Global Environment Facility (UNEP-GEP), Centre for Agriculture and Biosciences International (CABI), Department of Environment and Natural Resources (DENR), and its Biodiversity Management Bureau (BMB). We also thank the DENR for providing the permits for collection and local transport of specimens as well as accommodations in Davao City. We appreciate the assistance of the Protected Area Supervisor and field personnel of the Mount Hamiguitan Range Wildlife Refuge, specifically Felipe S Gorme, Jr. and Edwin Solis, and the members of Bantay Gubat who served as our guides and porters. We also thank our respective institutions, UPLB Museum of Natural History and the National Museum of the Philippines, for providing travel permits. We also thank J.J. Dida, of the Institute of Renewable Natural Resources, for the use of his computer to create the map. We also appreciate the help of Dr. Francisco Hita Garcia in determining the identity of some difficult *Tetramorium* specimens and of Doug Booher who confirmed that *Strumigenys* n.sp. HAM01 is an undescribed species. Finally, we are grateful to two anonymous reviewers whose comments and suggestions improved the manuscript.

## References

- Agosti, D. and Alonso, L.E. 2000. The ALL Protocol. In: D. Agosti, J.D. Majer, , L.E. Alonso, T.R. Schultz, (eds.). *Ants: Standard Methods for Measuring and Monitoring Biodiversity*. Washington, D.C.: Smithsonian Institution Press: 204-206.
- Amoroso, V.B. and Aspiras, R.A. 2011. Hamiguitan Range: a sanctuary for native flora. *Saudi Journal of Biological Sciences* 18: 7-15.
- AntWeb. 2017. Accessed from <http://www.antweb.org>.
- AntWiki. 2017. Accessed from <http://www.antwiki.org>.
- Balete, D.S., Heaney, L.R., Rickart, E.A., Quidlat, R. and Ibañez, J. 2008. A new species of *Batomys* (Mammalia: Muridae) from eastern Mindanao Island, Philippines. *Proceedings of the Biological Society of Washington* 121(4): 411-428.
- Bolton, B. 1976. The ant tribe Tetramoriini. Constituent genera, review of smaller genera and revision of *Triglyphothrix* Forel. *Bulletin of the British Museum (Natural History) (Entomology)* 34: 281- 379.
- Bolton, B. 1977. The ant tribe Tetramoriini. The genus *Tetramorium* Mayr in the Oriental and Indo- Australian regions, and in Australia. *Bulletin of the British Museum (Natural History) (Entomology)* 36: 67-151.
- Bolton, B. 1988. A review of *Paratopula* Wheeler, a forgotten genus of myrmicine ants. *Entomologist's Monthly Magazine* 124: 125-143.
- Bolton, B. 1991. New myrmicine ant genera from the Oriental region. *Systematic Entomology* 16: 1- 13.
- Bolton, B. 1992. A review of the ant genus *Recurvidris*, a new name for *Trigonogaster* Forel. *Psyche* 99: 35-48.
- Bolton, B. 2000. The ant tribe Dacetini. *Memoirs of the American Entomological Institute* 65: 1028 pp.
- Bolton, B. 2007. Taxonomy of the dolichoderine ant genus *Technomyrmex* Mayr based on the worker caste. *Contributions of the American Entomological Institute* 35(1): 1-150.
- Borowiec, M.L. 2016. Generic revision of the ant subfamily Dorylinae (Hymenoptera, Formicidae). *ZooKeys* 608: 1-280.
- Brown, W.L.Jr. 1975. Contributions toward a reclassification of the Formicidae. 5. Ponerinae, tribes Platythyreini, Cerapachyini, Cyldromyrmecini, Acanthostichini, and Aenictogitini. *Search Agriculture 5. Entomology (Ithaca)* 15: 1-115.
- Brown, W.L.Jr. 1978. Contributions toward a reclassification of the Formicidae. Part 6. Ponerinae, tribe Ponerini, subtribe Odontomachiti. Section B. Genus *Anochetus* and bibliography. *Studia Entomologica (N.S.)* 20: 549-652.
- Clouse, R.M., General, D.M., Diesmos, A.C. and Giribet, G. 2011. An old lineage of Cyphophthalmi (Opiliones) discovered on



- Mindanao highlights the need for biogeographical research in the Philippines. *Journal of Arachnology* 39:147-153.
- Dorow, W.H.O. 1995. Revision of the ant genus *Polyrhachis* Smith, 1857 on subgenus level with keys, checklist of species and bibliography. *Courier Forschungsinstitut Senckenberg* 185: 1-113.
- Eguchi, K. 2001. A revision of the Bornean species of the ant genus *Pheidole*. *Tropics Monograph Series* 2: 1-154.
- General, D.M. and Alpert, G.D. 2012. A synoptic review of the ant genera (Hymenoptera: Formicidae) of the Philippines. *ZooKeys* 200: 1-111.
- Hall R. 2002. Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer-based reconstructions, model and animations. *Journal of Asian Earth Science* 20: 353-434.
- Hosoishi, S. and Ogata, K. 2009. A taxonomic revision of the Asian endemic subgenus *Physocrema* of the genus *Crematogaster* (Hymenoptera: Formicidae). *Zootaxa* 2062: 15-36.
- Hosoishi, S. and Ogata, K. 2016. Systematics and biogeography of the ant genus *Crematogaster* Lund subgenus *Orthocrema* Santschi in Asia (Hymenoptera: Formicidae). *Zoological Journal of the Linnean Society* 176: 547-606.
- Kohout, R.J. 1987. Three new *Polyrhachis sexspinosa*-group species from the Philippines. *Memoirs of the Queensland Museum* 25: 169-176.
- Kohout, R.J. 2006. Review of *Polyrhachis* (*Cyrtomyrma*) Forel of Australia, Borneo, New Guinea and the Solomon Islands with descriptions of new species. *Memoirs of the Queensland Museum* 52: 87-146.
- Kohout, R.J. 2007. A review of the subgenus *Polyrhachis* (*Campomyrma*) Wheeler from Borneo with descriptions of new species. *Asian Myrmecology* 1: 7-17.
- Kohout, R.J. 2013. A review of the *Polyrhachis aculeata* species-group of the subgenus *Myrma* Billberg, with keys and descriptions of new species. *Australian Entomologist* 40: 137-171.
- Kohout, R.J. 2014. A review of the subgenus *Polyrhachis* (*Polyrhachis*) Fr. Smith, with keys and description of a new species. *Asian Myrmecology* 6: 1-31.
- Jaitrong, W. and Yamane, S. 2011. Synopsis of *Aenictus* species groups and revision of the *A. currax* and *A. laeviceps* groups in the eastern Oriental, Indo-Australian, and Australasian regions (Hymenoptera: Formicidae: Aenictinae). *Zootaxa* 3128: 1-46.
- Jaitrong, W. and Yamane, S. 2012. Review of the Southeast Asian species of the *Aenictus javanus* and *Aenictus philippinensis* species groups (Hymenoptera, Formicidae, Aenictinae). *ZooKeys* 193: 49-78. doi: 10.3897/zookeys.193.2768.
- Jaitrong, W. and Yamane, S. 2013. The *Aenictus ceylonicus* species group (Hymenoptera, Formicidae, Aenictinae) from Southeast Asia. *Journal of Hymenoptera Research* 31: 165-233.
- LaPolla, J.S. 2004. *Acropyga* (Hymenoptera, Formicidae) of the World. *Contributions of the American Entomological Institute* 33(3): 1-130.
- Lattke, J.E. 2004. A taxonomic revision and phylogenetic analysis of the ant genus *Gnamptogenys* Roger in Southeast Asia and Australasia. *University of California Publications in Entomology* 122: 1-266.
- Lohman, D.J., de Bruyn, M., Page, T., von Rintelen, K., Hall, R., Ng, P.K.L., Shih, H.T., Carvalho, G.R. and von Rintelen, T. 2011. Biogeography of the Indo-Australian archipelago. *Annual Review of Ecology, Evolution, and Systematics* 42: 205-226. doi: 10.1146/annurev-ecolsys-102710-145001.
- Mohagan, A. and Treadaway, C.G. 2010. Diversity and Status of Butterflies across Vegetation Types of Mt. Hamiguitan, Davao Oriental, Philippines. *Asian Journal of Biodiversity* 1: 1-24.
- NAMRIA. 2017. National Mapping and Resource Information Authority. Accessed from <http://www.namria.gov.ph>.
- Probst, R.S., Guénard, B. and Boudinot, B.E. 2015. Toward understanding the predatory ant genus *Myopias* (Formicidae: Ponerinae), including a key to global species, male-based generic diagnosis, and new species description. *Sociobiology*

- 62(2): 192-212. DOI: 10.13102/sociobiology.v62i2.192-212
- Schmidt, C.A. and Shattuck, S.O. 2014. The higher classification of the ant subfamily Ponerinae (Hymenoptera: Formicidae), with a review of ponerine ecology and behavior. *Zootaxa* 3817(1): 1-242.
- Schödl, S. 1998. Taxonomic revision of Oriental *Meranoplus* F. Smith, 1853. *Annalen des Naturhistorischen Museums in Wien* 100 B: 361-394.
- Sorger, D.M. and Zettel, H. 2011. On the ants (Hymenoptera: Formicidae) of the Philippine Islands: V. The genus *Odontomachus* Latreille, 1804. *Myrmecological News* 14: 141-163.
- Taylor, R.W. 1967. A monographic revision of the ant genus *Ponera* Latreille. *Pacific Insects Monograph* 13: 1-112.
- UNESCO. 2017. Mount Hamiguitan Range Wildlife Sanctuary. Accessed online at <http://whc.unesco.org/en/list/1403/> 30 January 2017.
- Villanueva, R.J. and Mohagan, A. 2010. Diversity and Status of Odonata across Vegetation Types of Mt. Hamiguitan, Davao Oriental, Philippines. *Asian Journal of Biodiversity* 1: 25-38.
- Wang, M. 2003. A monographic revision of the ant genus *Pristomyrmex*. *Bulletin of the Museum of Comparative Zoology* 157: 383-542.
- Ward, P.S. 2001. Taxonomy, phylogeny and biogeography of the ant genus *Tetraponera* in the Oriental and Australian regions. *Invertebrate Taxonomy* 15: 589-665.
- Ward, P.S., Blaimer, B.B. and Fisher, B.L. 2016. A revised phylogenetic classification of the ant subfamily Formicinae (Hymenoptera: Formicidae), with resurrection of the genera *Colobopsis* and *Dinomyrmex*. *Zootaxa* 4072(3): 343-357.
- Wilson, E.O. 1957. The *tenuis* and *selenophora* groups of the ant genus *Ponera*. *Bulletin of the Museum of Comparative Zoology at Harvard College* 116: 355-386.
- Xu, Z. and Zhou, X. 2015. Species grouping and key to known species of the ant genus *Echinopla* Smith (Hymenoptera: Formicidae) with reports of Chinese species. *Asian Myrmecology* 7: 19-36.
- Zettel, H. 2008. On the ants of the Philippine Islands: III. The genus *Recurvidris* Bolton. *Linzer Biologische Beiträge* 40/1: 891-895.
- Zettel, H. and Sorger, D.M. 2011. New *Myrmoteras* ants from the southeastern Philippines. *Raffles Bulletin of Zoology* 59: 61-67.



## A review of the genus *Pycnetron* Gahan (Hymenoptera: Pteromalidae) with description of a new species from Western Ghats, Kerala, India

Raseena Farsana V. K.<sup>1,2</sup>, \*Sureshan, P. M.<sup>1</sup> and Nikhil, K.<sup>1</sup>

<sup>1</sup>Zoological Survey of India, Western Ghat Regional Centre, Kozhikode-6, Kerala, India.

<sup>2</sup>University of Calicut, Kerala-673635, India.

(Email: pmsuresh43@gmail.com)

### Abstract

The genus *Pycnetron* Gahan (1925) (Hymenoptera: Chalcidoidea: Pteromalidae) is reviewed and a new species is described from Western Ghats, Kerala, India. Affinities of the new species with other known species of the genus are discussed and a key to the world species also provided.

**Keywords:** *Hymenoptera*, *Pteromalidae*, *Pycnetron*, new species, key to the world species, review, India.

Received: 07 March 2017; Revised: 28 September 2017; Online: 12 December 2017.

### Introduction

In this paper a new species of an interesting and rare genus *Pycnetron* Gahan (Pteromalidae: Chalcidoidea) collected from Western Ghats of Kerala, India is described. The genus *Pycnetron* Gahan belongs to the subfamily Pteromalinae, currently known by three species worldwide (Prinsloo 2005, Noyes 2016). The genus *Pycnetron* was described by Gahan with *P. curculionidis* Gahan from the Philippines. Bouček (1988) reported the occurrence of the genus from other localities in the Indo-Pacific region. He also provided a diagnosis of *Pycnetron* and commented on its relationship with other taxa of the subfamily Pteromalinae. Though the genus was first described from Philippine islands, the current distributional range of species indicates its probable African origin and later spread into the Southern and Eastern Asia to New Guinea and Australia. Presence of *Pycnetron* in the southern Western Ghats also indicates the occurrence of African elements in the Western Ghats and Peninsular India. Other species under the genus are *P. longicauda* (Risbec, 1952) described from Madagascar and *P. pix* Prinsloo, 2005 from South Africa. Presence of an unusually long tail of the laterally compressed female gaster and robust head and mesosoma with very broad

pronotum make the genus readily distinguishable from all other genera of the subfamily. Primary hosts of *Pycnetron* include families Curculionidae and Brentidae of Coleoptera (Noyes, 2016). This is the first record of the genus from India.

### Materials and Methods

The specimen of the present study was collected using sweep net from a locality at the edge of a moist deciduous forest patch with an agroecosystem of mixed crops. The area is located at Kakkadampoyil, Calicut district (11.33618°N & 76.11025°E) which lies in the foothills of southern Western Ghats, Kerala. The specimen was preserved in 70% ethyl alcohol and card mounted for microscopic observation. It was studied under a stereoscopic binocular microscope (Leica M 205 C) and photographed with LEICA MC 170 HD camera attached to the microscope. The specimen is deposited in the National Zoological Collections of ZSIK. The present description is based on a single specimen since further efforts to collect more specimens did not yield any additional material due to the rare nature of the genus.

The following abbreviations are used in the text, fu<sub>1</sub>-fu<sub>5</sub>: funicular segments 1-5; MV:

marginal vein; OOL: ocello-ocular distance; PMV: post marginal vein; POL: post-ocellar distance; SMV: submarginal vein; STV: stigmal vein, Gt<sub>1</sub>-Gt<sub>7</sub>: tergites 1-7 of gaster; ZSIK- Zoological Survey of India, Kozhikode.

### *Pycnetron* Gahan

*Pycnetron* Gahan, 1925: 91-93. Type species *Pycnetron curculionidis* Gahan, by monotypy.

**Diagnosis:** (Based on Bouček, 1988) Female gaster with long tail formed by the laterally compressed posterior part and narrow extended epipygium (Fig. 10); head and mesosoma robust; pronotum very broad without carina but with an abrupt angle to the slightly concave vertical front slope; scrobes deep and reaching the ocellus; antenna with three anelli in female and two in male; notauli not quite complete in some species; axillar grooves always very deep; apex of scutellum projecting, vertical, but frenal groove weak; mesopleuron anteriorly carinate, the carina starting at the lower third of prepectus as “epicnemial” carina and crosses to the other side near to the middle coxae, thus delimiting a short “mesosternal shelf”.

**Hosts:** *P. curculionidis* was reared from the weevil *Acicnemis filicornis* Husbenthal (Bouček, 1988). Hosts of *P. pix* include *Pissodes nemorensis* and *Antliarhinus peglerae* (Prinsloo, 2005).

**Distribution:** Queensland, Papua New Guinea, People’s republic of China, Philippines, Taiwan, Madagascar, South Africa (Noyes, 2016), India (current record).

### Key to the species of *Pycnetron* Gahan (Females)

1. Forewing with dark spot; propodeum with median carina, notauli incomplete.....2
- Forewing without dark spot; propodeum without median carina, notauli complete but weak towards posterior end.....3
2. Forewing disc palely infuscated with a bold, broad, dark brown patch extending from STV across wing disc near to posterior wing margin (Fig. 2, Prinsloo, 2005), antenna

dark brown except base of scape, fu<sub>2</sub>, fu<sub>3</sub> and basal half of fu<sub>4</sub> paler, basal claval segment black, apical two segments testaceous, fu<sub>1</sub> 2.8-3.3× as long as wide (Fig. 3, Prinsloo, 2005).....*P.longicauda* (Risbec)

- Forewing hyaline with a small roundish patch below STV not extending down as above (Fig. 9, Prinsloo, 2005); antenna with funicle and basal half of clava uniformly black, apical half of clava pale testaceous in contrast, fu<sub>1</sub> 2.5× as long as broad (Fig. 4, Prinsloo, 2005) .....*P.pix* Prinsloo
- 3. Scape reddish testaceous, 3 anelli subequal in length, fu<sub>1</sub> twice as long as broad (Fig. 1a, Gahan, 1925), Gt<sub>2</sub>-Gt<sub>6</sub> successively increasing slightly in length (Fig. 1b, Gahan, 1925).....*P.curculionidis* Gahan
- Scape brownish black except base testaceous, first anellus smallest, 0.77× length of second anellus and 0.58× length of third anellus (Fig. 5), fu<sub>1</sub> 1.5× as long as broad (Fig. 4); Gt<sub>2</sub> short, 0.44× as long as Gt<sub>1</sub> and 0.43× as long as Gt<sub>3</sub> (Figs. 9 & 10).....*P.keralaensis* sp. n.

### *Pycnetron curculionidis* Gahan

*Pycnetron curculionidis* Gahan, 1925, 27: 83-111, Holotype Female: Philippines (Not examined)

**Diagnosis:** (Based on Gahan, 1925) Female: Length, 5.6mm. Body black with scape and clava reddish testaceous; head strongly reticulate; face from slightly below the antennae with fine striae which converge at the mouth; three anelli subequal in length; fu<sub>1</sub> twice as long as broad, and the succeeding joints successively shortening (Fig. 1a, Gahan, 1925); mesoscutum, axillae and scutellum with close thimble-like punctuation; Gaster with Gt<sub>1</sub>- Gt<sub>6</sub> successively increasing slightly in length (Fig. 1b, Gahan, 1925).

**Male:** length, 4.2mm. Resembles female but differs in having antennae with 2 anelli and 6 funicular segments; metasoma not longer than mesosoma, gaster not strongly compressed; Gt<sub>7</sub> shorter than Gt<sub>6</sub> and not tubular but triangular.

**Distribution:** Queensland, Papua New Guinea,



People's republic of China, Philippines, Taiwan (Noyes, 2016)

**Host:** *Acicnemis filicornis* (Coleoptera: Curculionidae), Gahan, 192.

*Pycnetron keralaensis* sp. n.  
(Figs.1-10)

[urn:lsid:zoobank.org:act:0172EAC0-9907-42E0-AF95-FB226041F0C6](https://zoobank.org/urn:lsid:zoobank.org:act:0172EAC0-9907-42E0-AF95-FB226041F0C6)

**Female:** Length 4.5mm. Body black with slight metallic reflection on face, vertex, mesoscutum, axilla, metanotum, upper mesepisternum, metapleuron and nucha; antennae brownish black except half of first, second and third segments of clava and base of scape testaceous; mandibles brown with tips black; eyes reddish brown; ocelli brown; coxa concolorous with body, lateral parts of coxa and tibia with slight metallic reflection, tarsal segments except tip testaceous, apex and base of femur testaceous, remaining dark brown; tegula brown; wings hyaline, vein and pubescence brown; gaster brownish black, ventrally pale.

**Head:** Strongly reticulate, clypeal and paraclypeal area radiately striated, striae just reaching lower margin of eyes; clypeal margin weakly emarginated (Fig. 2). In front view head width  $1.27\times$  height; malar groove distinct; malar space  $0.49\times$  eye length, malar space and gena elongate reticulate, posterior margin of gena sharp and raised (Fig. 3); eye height  $1.4\times$  width in profile. Scrobal area very deep and reach median ocellus, scrobe moderately reticulate. In dorsal view head width  $2.24\times$  as broad as long; POL  $1.25\times$  OOL, temple  $0.36\times$  eye length; vertex and occiput closely reticulate. Antennae inserted above the level of lower ocular line (Fig. 2), scape  $0.76\times$  eye length and just short of reaching median ocellus, pedicel plus flagellum  $0.44\times$  as long as head width, pedicel  $1.36\times$  as long as wide and  $0.65\times$  as long as  $fu_1$ , first anellus small,  $fu_1$  and  $fu_2$  almost equal and remaining segments gradually decreasing in length (Fig. 4),  $fu_1$   $0.33\times$  as wide as long and  $fu_5$   $0.63\times$  as wide as long. Relative lengths: scape 3.4, pedicel 0.7, anellus, first 3.5, second 4.5 and third 6 (Fig. 5),  $fu_1$  1.5,  $fu_2$  1.48,  $fu_3$  1.2,  $fu_4$  1,

$fu_5$  0.8, clava 2; clava a little longer than two preceding segments combined.

**Mesosoma:** (Fig. 6) Pronotum  $5.2\times$  as broad as long,  $0.28\times$  as long as mesoscutum, raised reticulate. Mesoscutum  $1.64\times$  as broad as long, strongly reticulate with white pubescence, notauli almost complete but fading towards posterior part. Scutellum distinctly and strongly reticulate, length subequal to width; frenum absent. Propodeum (Fig.7) flat with fine reticulation,  $3.7\times$  as wide as long, median carina absent, plicae complete and touch transverse edge, behind which deep transverse groove separating nucha; metanotum shiny, dorsellum with fine engraved reticulation, spiracle long, oval close to metanotum, post spiracular groove not distinct, callus with white long hairs; nucha short and deeply concave at posterior end. Metapleuron and mesopleuron moderately reticulate, triangular shiny area in upper mesepimeron; prepectus finely reticulate, transverse length of prepectus almost equal to tegula. Forewing (Fig. 8)  $2.9\times$  as long as broad, discal pubescence moderately dense, speculum almost absent, basal cell and basal hairline with a few hairs, costal cell uniformly hairy, marginal fringe very small. Relative lengths: SMV 1.12, MV 0.47, PMV 0.6, STV 0.19. Hind coxae engraved reticulate, hind tibia widening towards posterior end with one spur.

**Metasoma:** Gaster (Figs. 9 & 10) sessile,  $1.44\times$  as long as head plus mesosoma combined and  $10.68\times$  as long as propodeum,  $Gt_1$ - $Gt_4$  incised in the middle,  $Gt_2$   $0.44\times$  as long as  $Gt_1$  and  $0.43\times$  as long as  $Gt_3$ ,  $Gt_7$   $3.6\times$  as long as  $Gt_6$ . Relative lengths:  $Gt_1$  0.35,  $Gt_2$  0.16,  $Gt_3$  0.36,  $Gt_4$  0.24,  $Gt_5$  0.34,  $Gt_6$  0.4.

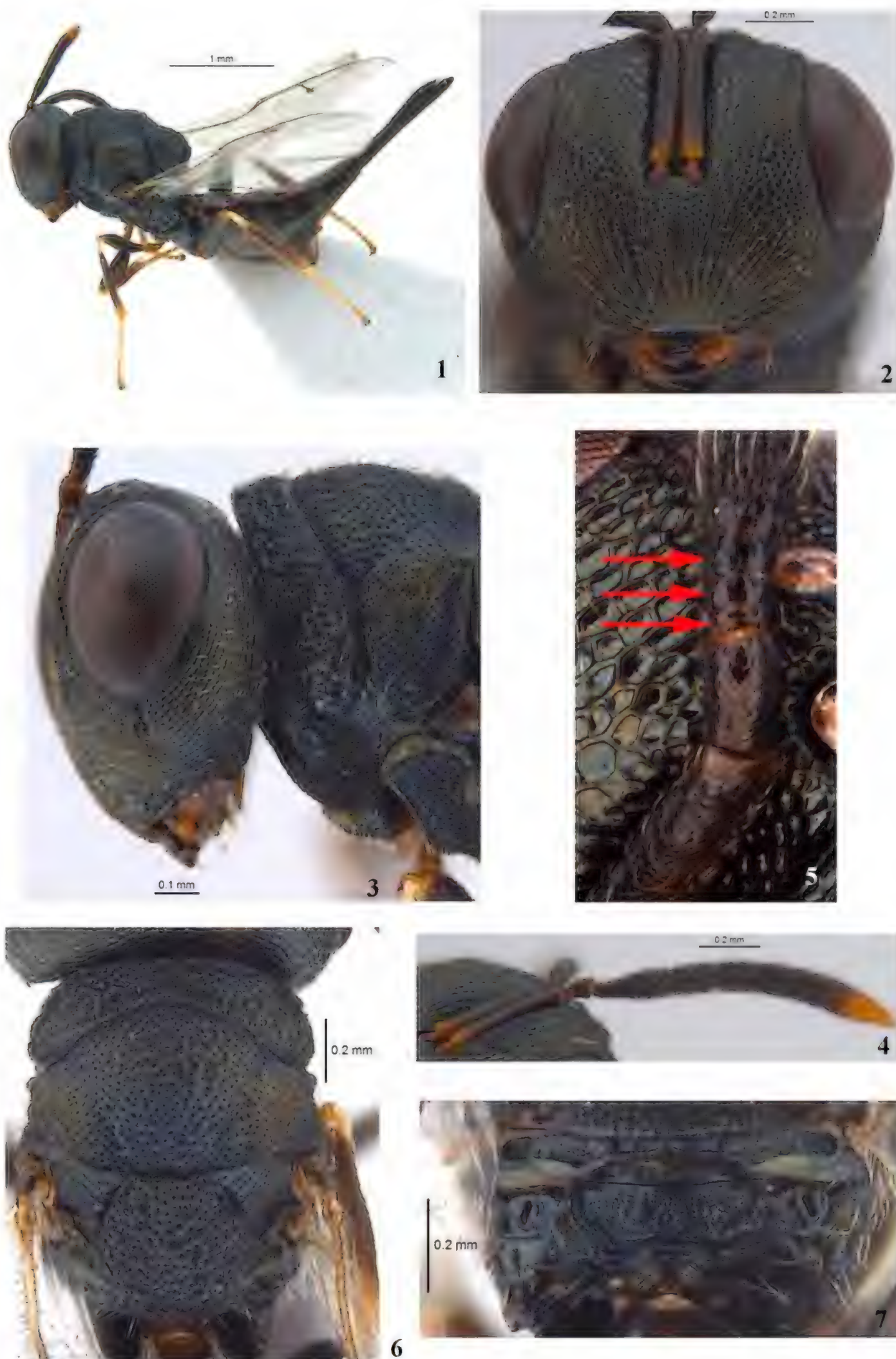
**Male:** unknown

**Material Examined:** Holotype: Female, India: Kerala, Calicut, Kakkadampoyil ( $11.33618^\circ\text{N}$  &  $76.11025^\circ\text{E}$ , elevation 674.6m), 13.i.2017, Coll. Dr.P.M.Sureshan. Reg.No. ZSI/WGRC/IR/INV/8603.

**Host:** Unknown.

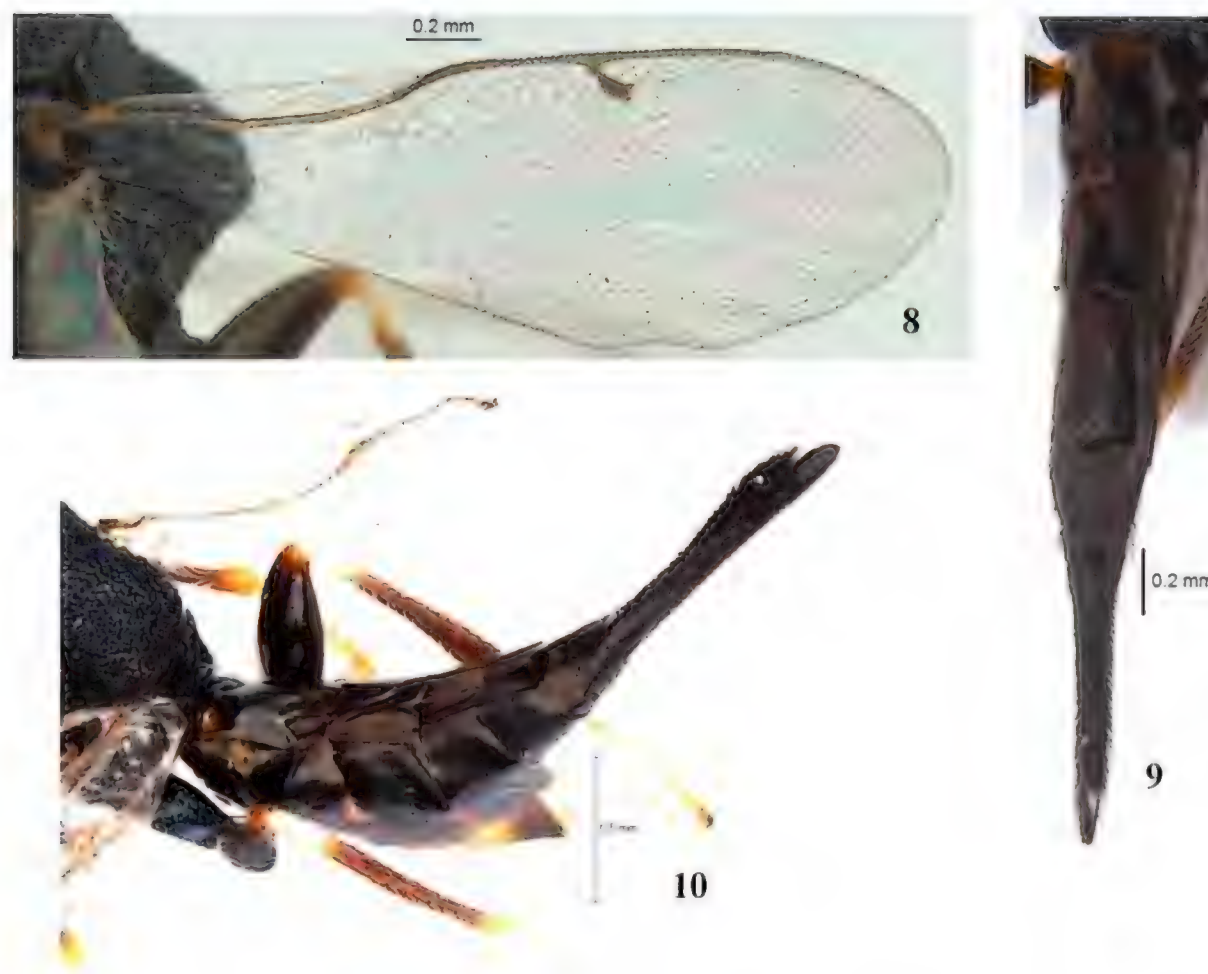
**Remarks:** *P. keralaensis* sp. n. closely resembles *P. curculionidis* Gahan but differs from it as follows: scape brownish black except





**Figs. 1-7. *Pycnetron keralaensis* sp. n. Female: 1. Body in profile; 2. Head in front view 3. Head and mesosoma (part) in profile; 4. Antenna; 5. Anelli; 6. Mesosoma in dorsal view; 7. Propodeum in dorsal view.**





**Figs. 8-10. *Pycnetron keralaensis* sp. n. Female: 8. Forewing; 9. Gaster in dorsal view; 10. Gaster in lateral view**

base testaceous, clava testaceous except basal half of first segment, 3 anelli different in length (Fig. 5), first anellus smallest,  $0.77\times$  as long as second anellus and  $0.58\times$  as long as third anellus,  $fu_1$   $1.5\times$  as long as broad (Fig. 4);  $Gt_2$  short (Figs. 9 & 10),  $0.44\times$  as long as  $Gt_1$  and  $0.43\times$  as long as  $Gt_3$ ; hind tibia with a single spur (in *P. curculionidis* scape and clava reddish testaceous, 3 anelli subequal in length (Fig. 1a, Gahan, 1925),  $fu_1$  twice as long as broad,  $Gt_1$ - $Gt_6$  successively increasing slightly in length (Fig. 1b, Gahan, 1925), hind tibia with two spurs). Absence of dark patch on forewing and propodeum without median carina make *P. keralaensis* sp. n. readily distinguishable from other two known species, *P. longicauda* and *P. pix* (Figs. 2 & 9, Prinsloo, 2005).

**Etymology:** The species name derives from the type locality Kerala (India).

***Pycnetron longicauda* (Risbec)**

*Aepocerus?* *longicauda* Risbec, 1952: 315-318

*Pycnetron longicauda* (Risbec): Bouček, 1976:21.

?*Pseudocatolaccus ranomafanae* Risbec: Bouček, 1976:21. (Not examined)

**Diagnosis:** (Based on Prinsloo, 2005) Female: Length, 6-9mm. Head and mesosoma black with slightly metallic tinge; antenna with scape except base, pedicel, anelli and basal funicular segments dark brown;  $fu_2$ ,  $fu_3$  and basal half of  $fu_4$  noticeably paler, the apex of  $fu_4$ ,  $fu_5$  and basal claval segment black, apical claval segments testaceous; notauli incomplete; forewing disc with a bold broad, dark patch extending from STV across wing disc to near posterior wing margin (Fig. 2, Prinsloo, 2005); propodeum with median carina.

**Male:** unknown

**Distribution:** Madagascar

**Host:** Unknown

***Pycnetron pix* Prinsloo**

*Pycnetron pix* Prinsloo, 2005, 13(2):344-346. (Not examined)

**Diagnosis:** (Based on Prinsloo, 2005) Female: Length, 7-8mm. Head and mesosoma black and shiny; antenna with funicle and basal half of clava uniformly black, apical half of clava pale

testaceous in contrast, forewing with roundish patch below STV (Fig. 9, Prinsloo, 2005),  $fu_1$  2.5× as long as broad (Fig. 4, Prinsloo, 2005), clypeal margin medially forming two blunt teeth, pronotal collar medially 0.2× length of mesoscutum (Fig. 8, Prinsloo, 2005); basal cell bare except 1-5 setae just below SMV; hind tibia with 2 short spurs.

**Male:** resembles female but differs as follows: antenna with 2 anelli and 6 funicular segments (Fig. 5, Prinsloo, 2005); forewing a little broader, 2.4× as long as wide; gaster short and broad, as long as mesosoma.

**Distribution:** South Africa

**Host:** *Pissodes nemorensis* (Coleoptera: Curculionidae) and *Antliarhinus peglerae* (Coleoptera: Brentidae) (Prinsloo, 2005).

### Acknowledgements

The authors are thankful to Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata for facilities and encouragement. RFVK is grateful to University Grants commission, New Delhi for awarding the Moulana Azad Fellowship to pursue Ph.D. PMS and NK is also grateful to the ministry of Environment Forests, Government of India for funding the research on Indian Pteromalidae through the AICOPTAX project.

### References

- Bouček, Z. 1976. African pteromalidae (Hymenoptera): new taxa, synonymies and combinations. Journal of the Entomological Society of Southern Africa 39: 9-31.
- Bouček, Z. 1988. Australasian Chalcidoidea (Hymenoptera). *A biosystematic revision of genera of fourteen families, with a reclassification of species*. Aberystwyth, Wales: CAB International, Wallingford, Oxon, U.K., Cambrian News Ltd. 832pp.
- Gahan, A.B. 1925. A second lot of parasitic Hymenoptera from the Philippines. Philippine Journal of Science 27: 83-111.
- Noyes, J.S. 2016. Universal Chalcidoidea database. <http://www.nhm.ac.uk/jdsml/research-curation/projects/chalcidoids>. Last

updated April 2015 (last updated September 2016).

Prinsloo, G.L. 2005. Description of *Pycnetron pix* sp. nov. (Hymenoptera:Pteromalidae), and indigenous parasitoid of the exotic pine weevil *Pissodes nemorensis* (Curculionidae) in South Africa, and comments on the identity of *Pycnetron longicauda* (Risbec). African Entomology 13(2): 344-346.

Risbec, J. 1952. Contribution a l'étude des Chalcidoïdes de Madagascar. Memories del'institut Scientifique de Madagascar (E) 2: 1-449.



# First report of *Menemerus nigli* (Araneae: Salticidae) from India

Sumantika Chatterjee, John T. D. Caleb, Kaomud Tyagi, Shantanu Kundu & Vikas Kumar\*

Centre for DNA Taxonomy, Molecular Systematics Division, Zoological Survey of India,  
Kolkata, West Bengal, India

(Email: vikaszsi77@gmail.com)

## Abstract

*Menemerus nigli* Wesolowska & Freudenschuss, 2012 previously known from Western Pakistan is reported in Eastern India. Illustrations of the habitus, male palp and distribution map are provided. DNA barcode data obtained for this species is available at BOLD.

**Keywords:** spider, Pakistan, Aranei, easternmost record.

Received: 7 April 2017; Revised: 26 July 2017; Online: 26 December 2017.

## Introduction

The genus *Menemerus* Simon, 1868 is represented by 67 nominal species. Of which, five species are known from India; *Menemerus albocinctus* Keyserling, 1890, *M. bivittatus* (Dufour, 1831), *M. brachygnathus* (Thorell, 1887), *M. brevibulbis* (Thorell, 1887) and *M. fulvus* (L. Koch, 1878) (Prószyński 2016, World Spider Catalog 2017). In the present study, we report *M. nigli* Wesolowska & Freudenschuss, 2012 for the first time from India. The species was previously known only from its type locality in Pakistan. Furthermore, the validity of the species has been confirmed with DNA barcode.

## Materials and Methods

The specimen was hand collected and stored in 70% alcohol. It was later examined and photographed using Leica EZ4 HD stereomicroscope. All images were then processed with the aid of LAS core software (LAS EZ 3.0). Species was identified using diagnostic keys provided by Wesolowska & Freudenschuss (2012). All measurements are in millimeters. The studied specimen has been deposited in the NZC (National Zoological Collections) at the Zoological Survey of India, Kolkata. Legs were used for isolation of genomic DNA. Amplification of the partial fragment cytochrome C oxidase subunit I (mtCOI) gene was performed following Barrett & Hebert (2005). The sequencing was

carried out on 3730 DNA Analyzer (Applied BioSystems) in the in-house sequencing facility of Zoological Survey of India. The resulting sequence was submitted to BOLD (Barcode of Life Data Systems) under the project titled “Barcoding Spiders of India” with barcode index number (BIN) AAQ0156.

## Taxonomy

### *Menemerus nigli* Wesolowska & Freudenschuss, 2012

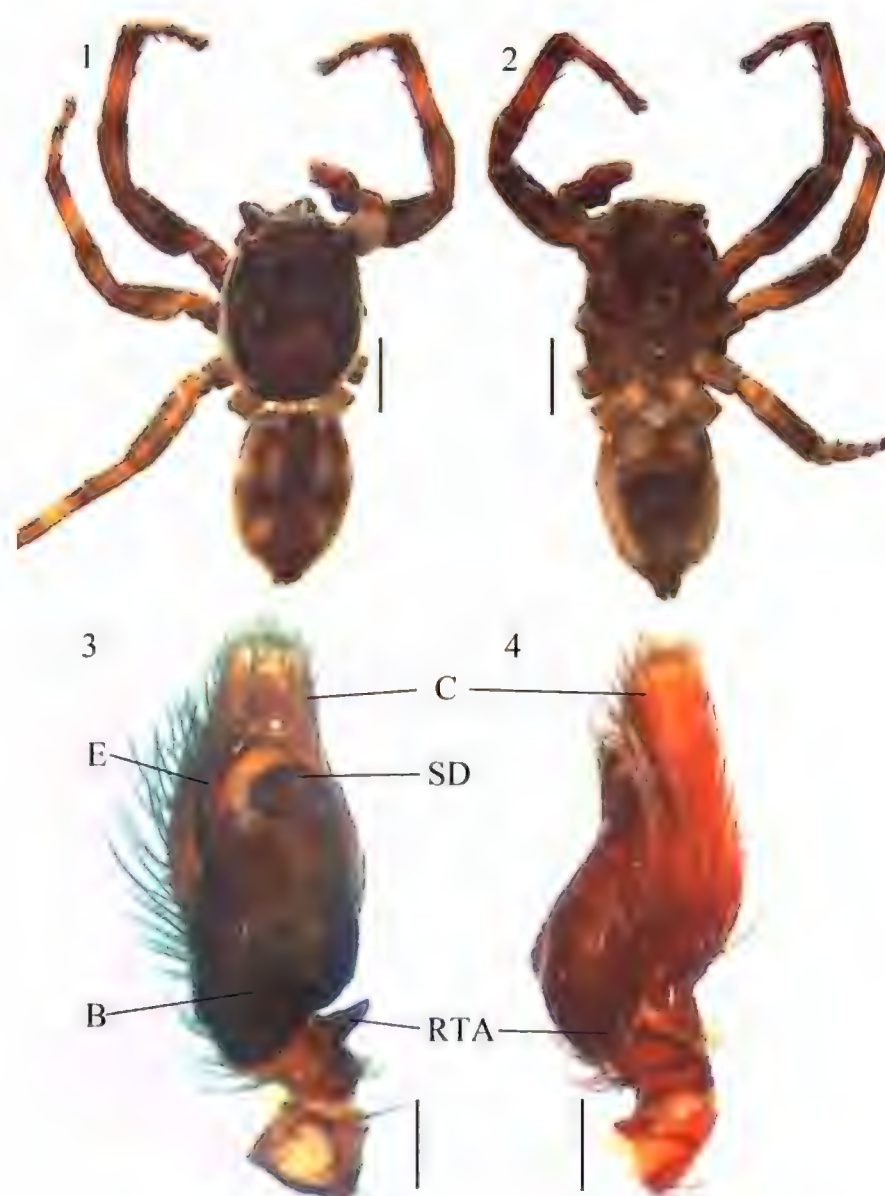
(Figs. 1-4, Map)

*Menemerus nigli* Wesolowska and  
Freudenschuss, 2012: 449, figs. 1-6 (♂).

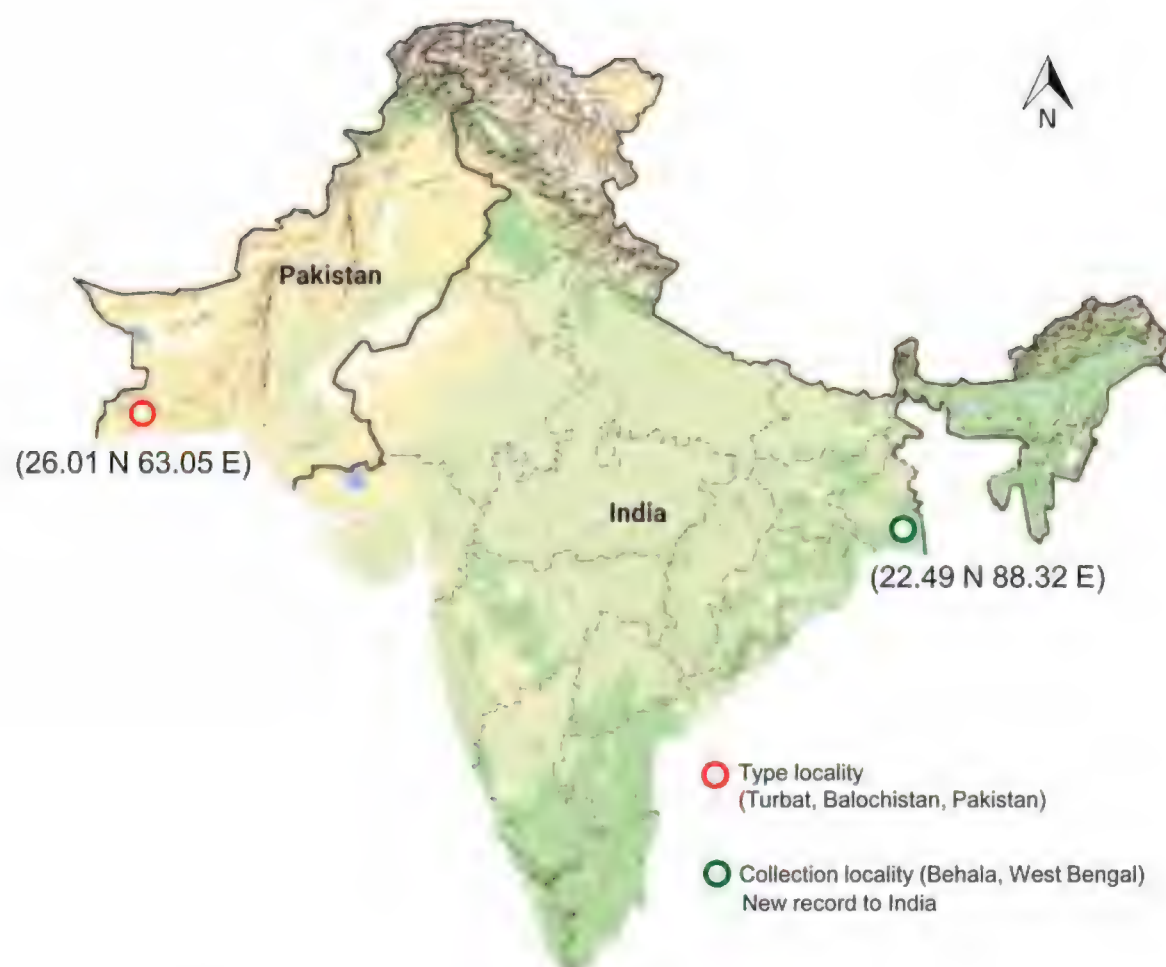
**Material examined:** INDIA. 1♂ (ZSI-AA-451), Behala, Kolkata district, West Bengal (22.49°N, 88.32°E, 11m), 7.viii.2016, leg. Sumantika Chatterjee.

**Comments:** Total length 4.89. Carapace 2.44 long, 1.9 wide; abdomen 2.45 long, 1.66 wide. Eye field: length 1.12, anterior width 1.57, posterior width 1.45. This species is known from a single male holotype from Western Pakistan which was collected under the stone. The specimen from India was collected on a wall from human habitation, inside a building.

**Distribution:** The species was described from Turbat, Pakistan. The new locality lies over 2500kms away from the type locality. This is



**Figs. 1–4: *Menemerus nigli*, male. 1, dorsal view; 2, ventral view; 3, male left palp, ventral view; 4, same, retrolateral view. Abbreviations: B – bulb, C – cymbium, E – embolus, RTA – retrolateral tibial apophysis, SD – sperm duct. Scales; 1–2, 1 mm; 3–4, 0.25 mm.**



**Figure 5. Map of distributional records of *Menemerus nigli*.** The original template of the terrain map copied from Google Map (<https://maps.google.com>) and edited in Adobe Photoshop CS 8.0



the easternmost record of the species (Map).

**Molecular Data:** The DNA barcode data of *M. nigli* was evaluated in the similarity search engine of BOLD database (Ratnasingham & Hebert 2007). The sequence developed in our study showed 100% similarity with sequences of *M. nigli* from Pakistan. The mtCOI barcode profile of this species is given.

TATAGTAGGAAGTCAATAAGAGTATT  
AATTCGAATGGAGTTAGGTCAAACGGG  
AAGTTTTTTAGGAAATGATCATATATAT  
AATGTAATTGTTACTGCTCATGCTTTTG  
TTATAATTTTTTTTATAGTAATACCTAT  
TTTAATTGGAGGGTTTGGAAATTGATTA  
GTTCTCTAATGTTAGGTGCTCCTGATA  
TAGCTTTTCCTCGAATAAATAATTTAAG  
ATTTTGATTATTACCTCCTTCCTTGATA  
TTATTGTTTGTTTCATCTTTAGCTGAAA  
TAGGAGTAGGAGCTGGATGAACAGTAT  
ATCCTCCTTTGGCTTCAATTGTTGGACA  
TAATGGAAGATCGGTGGATTTTGCTATT  
TTTTTCATTACATTTAGCTGGAGCTTCAT  
CTATTATAGGTGCTATTAATTTTATTTT  
AACTGTAATTAATATACGTTCTGTTCAA  
ATAAGATTAGATAAGGTTCTCTATTTG  
TGTGATCAGTTGTTATTACTGCTGTGCT  
TCTTTTGTTATCTTTACCTGTTTTAGCAG  
GTGCAATTACTATATTATTAACAGATCG  
AAATTTTAATAAC

### Acknowledgements

The authors are grateful to Dr Kailash Chandra, Director, Zoological Survey of India for his encouragement and moral support and for providing necessary facilities to carry out the work. We thank Dr Yuri Marusik for reviewing and providing valuable comments on the manuscript. This work is a part of the Ph. D thesis of the first author.

### References

- Barrett, R.D.H., and Hebert, P.D.N. 2005. Identifying spiders through DNA barcodes. *Canadian Journal of Zoology* 83: 481–491.
- Prószyński, J. 2016. Salticidae (Araneae) of the world, Chapter II. Available at <http://www.peckhamia.com/salticidae/index.html> (accessed 24 March, 2017)
- Ratnasingham, S. and Hebert, P.D.N. 2007. BOLD: The Barcode of Life Data System ([www.barcodinglife.org](http://www.barcodinglife.org)). *Molecular Ecology Notes* 7: 355–364. DOI:10.1111/j.1471-8286.2006.01678.x
- Wesołowska, W. and Freudenschuss, M. 2012. A new species of *Menemerus* from Pakistan (Araneae: Salticidae). *Genus* 23: 449–453.
- World Spider Catalog 2017. World Spider Catalog. Natural History Museum Bern, online at <http://wsc.nmbe.ch>, version 18.0. (accessed 24 March 2017)

## Review of the genus *Ipidia* Erichson of India (Coleoptera: Nitidulidae: Nitidulinae)

T. K. Pal\* and J. Dasgupta

*Zoological Survey of India, 'M' Block, New Alipore, Kolkata-700053, India.*

(Email: tkpal51@rediffmail.com)

### Abstract

Two species of *Ipidia* [viz. *Ipidia* (*Hemipidia*) *sjoevergi* Jelínek, 1978 and *Ipidia* (*Ipidia*) *variolosa* Reitter, 1879] have been worked out of a collection from India. The genus and the species are re-described. A key to the species of *Ipidia* from India is appended.

**Keywords:** *Coleoptera*, *Nitidulidae*, *Nitidulinae*, *Ipidia*, *Review*, *India*.

Received: 4 January 2017; Revised: 10 August 2017; Online: 24 December 2017.

### Introduction

*Ipidia* Erichson is a comparatively small genus with two species [viz. *Ipidia* (*Hemipidia*) *sjoevergi* Jelínek, 1978 and *Ipidia* (*Ipidia*) *variolosa* Reitter, 1879] hitherto recorded from India. Erichson (1843) erected the genus *Ipidia* for the species *Ips quadrinotata* Fabricius, 1798 [= *Ipidia binotata* Reitter, 1875] based upon characters, such as: straight and parallel antennal groove; emarginated labrum; thickened labial palpi; bilobed apices of mandibles etc., and placed it under the subfamily 'Nitidulinae'. Redtenbacher (1845, 1858) keyed out the genus *Ipidia* from other genera of 'Nitidulae'. Erichson (1845), Redtenbacher (1849, 1874), Bach (1851), Gutfleisch and Bose (1859), Reitter (1873, 1911), Everts (1881, 1898) noted several other characteristic features of the genus *Ipidia*. Lacordaire (1854) and Jacquelin du Val (1858) re-described the genus *Ipidia*. Thomson (1859, 1862) pointed out certain characteristic features of the genus *Ipidia*. Thomson (1867) keyed out the genus '*Ipidia*' from other genera of subfamily Nitidulinae. Reitter (1884) dealt with the species of *Ipidia* from Japan. Marseul (1885) noted the diagnostic characters of *Ipidia* and re-described few species from the old world. Ganglbauer (1899) re-characterised *Ipidia* and several species under it from Middle Europe. Grouvelle (1913) in '*Coleopterorum Catalogus*' listed four species under the genus *Ipidia* from

across the world. Jelínek (1965) differentiated *Ipidia* from the closely related genus *Stelidota* Erichson and dealt with several Palaearctic species of these genera.

Jelínek (1978) described a species of *Ipidia* namely, *I. sjoevergi* from Darjeeling, and which is the first record of the genus from the Indian subcontinent. Kirejtshuk (1992) erected a new subgenus viz., *Hemipidia* under *Ipidia*. Kirejtshuk (2005) synonymised three species of *Ipidia* from Japan namely, *I. chujoi* Hisamatsu, 1982, *I. kinabalensis* Hisamatsu, 1982 and *I. krikkeni* Hisamatsu, 1982 with *I. sjoevergi* Jelínek. Jelínek and Audisio (2007) in the '*Catalogue of Palaearctic Coleoptera*' recognised two subgenera under *Ipidia* namely, *Ipidia* (s. str.) and *Ipidia* (*Hemipidia*) Kirejtshuk, 1992. Kirejtshuk (2008) proposed *Ipidia*-complex [which consists of 5 genera namely, *Ipidia* Erichson, 1843, *Platychora* Erichson, 1843, *Taracta* Murray, 1867, *Psilotus* Fischer, 1829 and *Perilopa* Erichson, 1843] under Tribe Nitidulini Erichson, 1843 of the subfamily Nitidulinae.

Till now, only two species viz., *Ipidia* (*Hemipidia*) *sjoevergi* Jelínek, 1978 and *Ipidia* (*Ipidia*) *variolosa* Reitter, 1879 were recorded from India (Darjeeling dist., West Bengal and Arunachal Pradesh respectively).



Some earlier collections of *Ipidia* by one of the authors (TKP in 1988) and other collectors of ZSI (S. W. Kemp in 1911 and 1917; T. Sengupta in 1976; A.R. Bhowmick in 1976; and S. Biswas in 1981 and 1983) from the states of West Bengal, Assam, Meghalaya, and Arunachal Pradesh formed the basis of this study. Two species were studied, and the present paper deals with the systematic account of the genus *Ipidia* from India.

### Materials and Methods

Collected specimens of sap beetles were mounted on rectangular hard paper board and pinned with proper locality and habitat data. For detailed morphological study, slides were prepared of the dissected parts. Mounted dry specimen of *Ipidia variolosa* Reitter, 1879 was relaxed first by putting in water for about an hour. The relaxed specimen was placed on glass slide with a drop of water and the hind wings and elytra were dissected out under a dissecting microscope. The wingless body was then placed in 10% KOH solution, after minor incision between pro- and mesothorax and metathorax and abdomen, for about 24 hours. The specimen was then washed in distilled water and mild acetic acid solution for 10 minutes respectively. The washed specimen was passed on to absolute alcohol through 30%, 50%, 70%, 90% grades of alcohol for 5 minutes in each grade. The detached elytra and wings were similarly dehydrated as above. All the parts were kept in absolute alcohol for about 10-15 minutes for complete dehydration and then transferred to clove oil. The body parts of the specimen were then placed on a clear glass slide with a drop of clove oil and finally dissected under a WILD M5A stereoscopic binocular microscope. The dissected parts were mounted in Canada balsam by cover slips. For studying male genitalia of other specimens, their abdomens were separated from the body. The wet/water soaked abdomens were placed in 10% KOH solution for about 24 hours and then passed on to clove oil in above manner. Each of the male genitalia was dissected out with two fine dissecting needles under the stereomicroscope and placed in a drop of Canada balsam on a piece of cover glass. The cover glass was glued on a piece of ivory paper and pinned with the respective specimen with

required data. External features and other structures were studied using Leica ® M205A stereoscopic microscope with magnification 7.81× to 160.1× and images were recorded, when necessary. Illustrations were made with the aid of Camera lucida; detailed features of various body parts were sketched by using the digitised images, and examination under an OLYMPUS compound microscope. The materials examined in this study are now housed in the Zoological Survey of India, Kolkata (ZSIC).

### Results

Altogether 2 species are recognised under *Ipidia* [viz., *Ipidia (Hemipidia) sjobergi* Jelínek, 1978 and *Ipidia (Ipidia) variolosa* Reitter, 1879]. The genus and its species are characterized and included in the key to the species from India.

#### SYSTEMATIC ACCOUNT

Family NITIDULIDAE Latreille, 1802

Subfamily NITIDULINAE Latreille, 1802

Tribe Nitidulini Erichson, 1843

Genus *Ipidia* Erichson, 1843

*Ipidia* Erichson 1843: 289 [Type species: *Ips quadrinotata* Fabricius 1798]; Erichson 1845: 139; Redtenbacher 1845: 74; Redtenbacher 1849: 19, 163; Bach 1851: 201; Lacordaire 1854: 301, 304; Redtenbacher 1858: LXXIX, 328; Jacquelin du Val 1858: 140, 158; Gutfleisch 1859: 233, 236; Thomson 1859: 68; Thomson 1862: 162; Thomson 1867: 377; Seidlitz 1872: 31, 144; Reitter 1873: 10, 54; Redtenbacher 1874: LXXXVI and 360; Reitter 1875: 9; Everts 1881: 12, 30; Reitter 1884: 260, 262; Marseul 1885: 19, 44; Seidlitz 1888a: 19, 44; Everts 1898: 469, 479; Ganglbauer 1899: 463, 465; Stierlin 1900: 519, 529; Reitter 1911: 25, 27; Grouvelle 1913: 130; Jelínek 1965: 218; Jelínek and Audisio 2007: 473; Kirejtshuk 2008: 110.

**Description:** *General appearance* (Fig. 1–18): Broadly ovoid to somewhat rectangular in shape, somewhat depressed dorsoventrally, rather

shiny; dorsal cuticle punctate and covered with very tiny setae, reddish brown to pitch black; antenna with a compact three-segmented club, pronotal and elytral sides somewhat explanate; each elytron possesses longitudinal striations running from its base to apex; abdominal segments almost entirely covered by elytra dorsally, pygidium rarely visible; adult males possess an additional anal sclerite posteriorly.

**Head** (Fig. 1) moderately large, transverse, considerably narrower than prothorax and partly inserted within it, mandibles partly exposed, no fronto-clypeal suture; eyes moderately large, projecting, coarsely faceted, tempora indistinct; neck constriction somewhat distinct. Tentorium with two long tentorial arms and a transverse corporotentorium in posterior third. Antenna longer than head; antennal insertions partly concealed under projections of frons, scape subglobular to slightly elongate, segment 2 rather short, segment 3 about twice as long as segment 2, narrower than scape and distinctly elongate, segments 4 to 7 subequal and more or less elongate, segment 8 more transverse and broader than preceding segments; club 3-segmented, slightly longer than broad, segments closely arranged. Ventrally, antennal grooves narrow and subparallel, running longitudinally along inner sides of the eyes. Mandible (Fig. 9) slightly longer than broad, with a large bifid apical tooth on inner margin, mola well-developed, protheca setose, no distinct mandibular cavity. Maxilla (Fig. 10) devoid of galea; lacinia elongate, apex broadly rounded, apex and inner margin densely hairy; palpi with palpomere 1 narrow-short, palpomere 2 transverse, longer than palpomere 1 and broader than all other palpomeres; palpomere 3 about as long as palpomere 2 and transverse, palpomere 4 (apical segment) longer than preceding palpomeres and fusiform, apex setose. Labium (Fig. 11) with mentum distinctly transverse, punctate-pubescent, apical margin bi-sinuate; ligula transverse with extremities projecting like a lateral flap on each side; palpi with palpomere 1 narrow-short, palpomere 2 broad-transverse, palpomere 3 subglobular, longer than palpomere 2 with rounded apex. Labrum (Fig. 12) transverse, apical margin arcuate and with a median cleft; dense setae present on apical margin and on dorsal surface near middle.

**Prothorax** (Fig. 2) transverse, broader posterad, about as broad as elytra; apical margin broadly emarginate; anterior and posterior angles usually projecting; lateral margins arcuate; pronotal disc feebly convex; prosternal process moderately broad, slightly narrower between coxae, distinctly broader near apex, apex almost truncate or broadly rounded; front coxae narrowly separated internally; coxal cavities distinctly transverse, externally and internally closed, trochantins exposed; notosternal sutures extending to anterior angles.

**Meso-metathorax** (Fig. 3): Mesocoxae not more widely separated externally than front coxae, coxal cavities open outwardly, mesoventral process contacting metaventral process between mesocoxae almost in a straight line. Metaventrite transverse, densely punctate, discrimen extending to about two-thirds of length of metaventrite from base, hind coxae more widely separated than mesocoxae; mesocoxae bordered by coxal lines reaching almost the half of the distance along metaventral-metanepisternal suture, forming distinct axillary space. Metendosternite (Fig. 15) well-developed, with a broad basal stalk, two lateral arms, anterior tendons rather closely situated.

**Elytra and Wings:** Elytra (Fig. 5) elongate, apices separately rounded; punctation distinct, arranged generally in nine longitudinal rows; setae very minute, closely appressed; epipleura moderately developed and extending almost up to apex; pygidium marginally exposed. Wing (Fig. 7) simple and venation reduced, with moderately long radial vein, cubitus vein discontinuous, trace of single anal vein; without subcubital fleck or radial cell.

**Legs** (Fig. 8) moderately long, trochanters short and simple, femora broadened medially; slender tibiae slightly broadened at apex, with two apical spurs; tarsal formula 5-5-5 in both sexes; tarsomeres 1-3 bilobed, dilated and densely setose apically; tarsomere 4 shortest, claws simple.

**Abdomen** (Fig. 6) slightly longer than broad, pygidium often not visible from above (concealed beneath elytra); intercoxal process moderately broad and its apex somewhat rounded; ventrites 2-4 short and subequal, ventrite 5 longer than preceding three ventrites.



An anal sclerite (tergite VIII) present in males at the end of 5<sup>th</sup> ventrite.

**Genitalia:** Aedeagus (Fig. 16–18) with elongated median lobe, dorsoventrally flattened; a single median strut running along ventral face; tegmen forming an elongate curved plate or hood, with rounded apex and a tuft of long setae arising on either side of middle, lateral edges subparallel, tegminal struts join to form ring. Spiculum gastrale and anal sclerite as in Fig. 13. Ovipositor (Fig. 14) with well-developed paraprocts, valvifers enveloped, coxites, and slender styli attached pre-apically to the coxites.

**Sexual Dimorphism:** Males possess an anal sclerite at posterior extremity.

**Habitat:** The species dealt with were collected mostly from subcorticolous habitat or on moist log; feed presumably on the fungi and decomposed plant sap.

**Distribution:** Distributed mainly in the Palearctic region and Indo-Burma subregion of the Oriental region.

#### Key to the species of *Ipidia* of India

1. Body somewhat rectangular. Elytra concolourous, black; striae punctures large, elongate-oval; interstices mostly flat-topped, 7<sup>th</sup> interstriae distinctly carinate. Male genitalia (Fig. 16–18, 25) with broadly rounded apex of tegmen, spatula-shaped with a dense tuft of setae arising from the ventral side of the apical margin, on either side of the middle of apex; median lobe pear-shaped, apically broad, somewhat narrower at the base, with apex broadly rounded, tip slightly acuminate.....  
.....***I. (Ipidia) variolosa* Reitter**
- Body oblong-ovate. Each elytron with a pair of pale conspicuous spots, one beneath the basal margin and the other below middle near apical one-third; striae punctures minute, rounded; interstices feebly convex and slightly ribbed. Male genitalia (Fig. 20, 22, 23) with tegmen slightly expanded laterally beyond middle and then gradually tapering towards apex, spoon-shaped with

small and fine setae arranged on the ventral face of the apical margin, median lobe leaf-shaped, broad at base and narrower apically, with pointed tip.....

.....***I. (Hemipidia) sjobergi* Jelínek**

#### Subgenus *Ipidia* (*Ipidia*) Erichson, 1843

##### Diagnostic characters:

Body parallel-sided, at least twice as long as wide, prothorax at least twice as wide as long. Elytra flat, sharply curved at the sides at the 7<sup>th</sup> interstria, which has an appearance of passing through the hump ribs of the shoulder; elytral punctures consist of a regular series of simple points.

##### 1. *Ipidia* (*Ipidia*) *variolosa* Reitter, 1879

*Ipidia variolosa* Reitter, 1879: 215.

*Ipidia (Ipidia) variolosa*: Kirejtshuk, 2005: 188.

**Diagnosis** (Fig. 24, 26) elongate, somewhat rectangular, dorsally subdepressed, moderately shiny, colour dark-brown to blackish, lateral edges explanate, sharp longitudinal interstices on each elytron running almost parallel to the elytral suture from base to apex, coarsely punctate cuticle; fine, sparse, white, appressed setae on dorsum.

**Head:** transverse, exposed part about 1.2x as broad as long, distinctly narrower than prothorax, frons feebly depressed; punctures on vertex round, about 4x as large as those of eye facets; punctation on frons small, round, distinct, diameter about as large as those of eye facets, separated by about 2–3 diameter of punctures; eyes moderately large and moderately projected, about 0.3x as long as head, outer margin rounded, somewhat finely faceted; temple indistinct; setae not visible on head. Antenna about 1.6x as long as head; antennal club about 1.3x as long as broad, club segments compact, about 0.3x as long as antenna.

**Prothorax:** transverse (1.0:1.7), anterior margin broadly emarginate; sides arcuate, posterior margin bisinuate, anterior angles obtuse, posterior angles rather sharply pointed, slightly projected posteriorly. Pronotum rather convex,

# PLATE- I

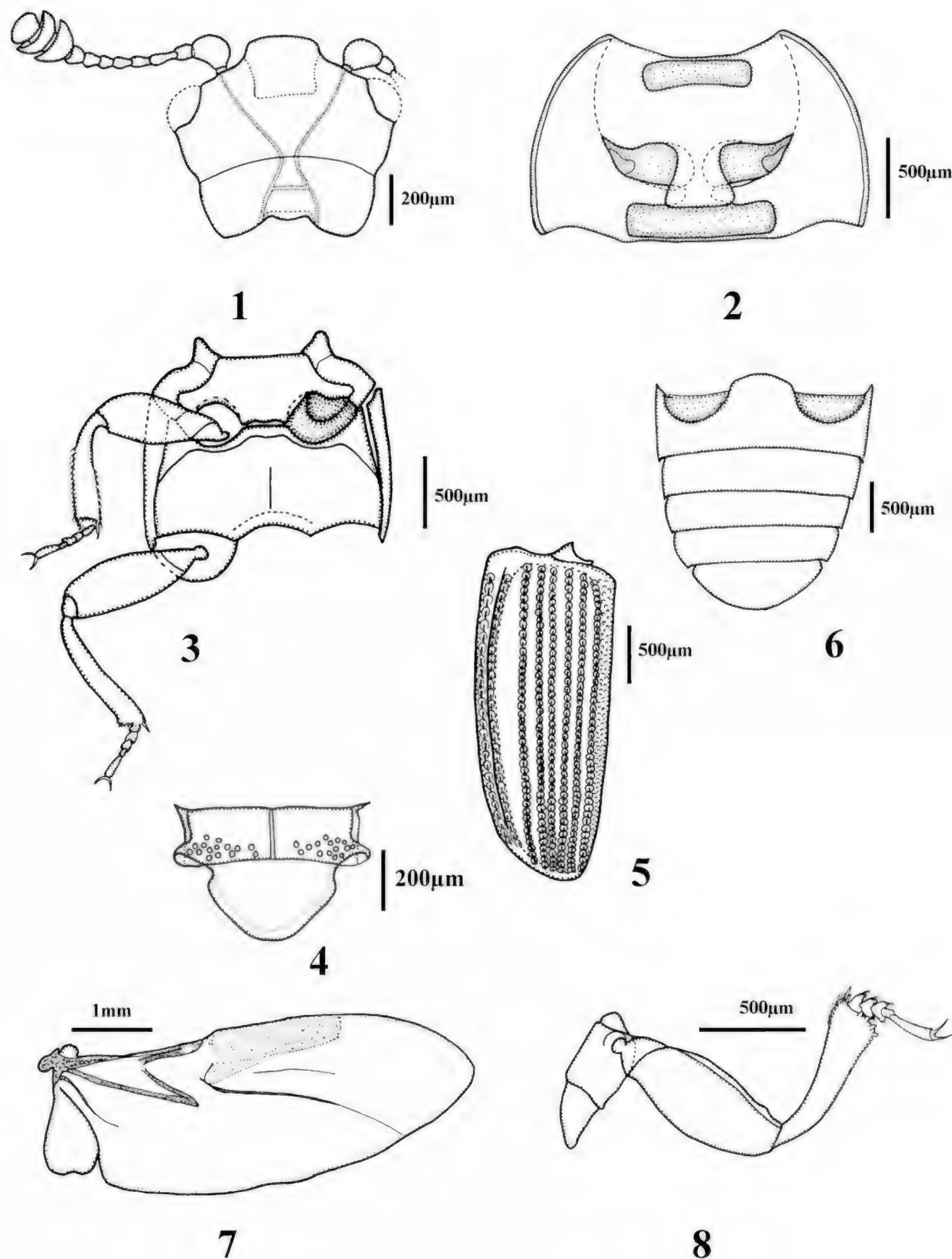


PLATE I. Figs. 1–8. *Ipidia variolosa* Reitter, 1879: 1, Head, Dorsal view; 2, Prothorax, Ventral view; 3, Meso-metathorax, Ventral view; 4, Scutellum, Dorsal view; 5, Left elytron, Dorsal view; 6, Abdomen, Ventral view; 7, Wing; 8, Front leg.



PLATE- II

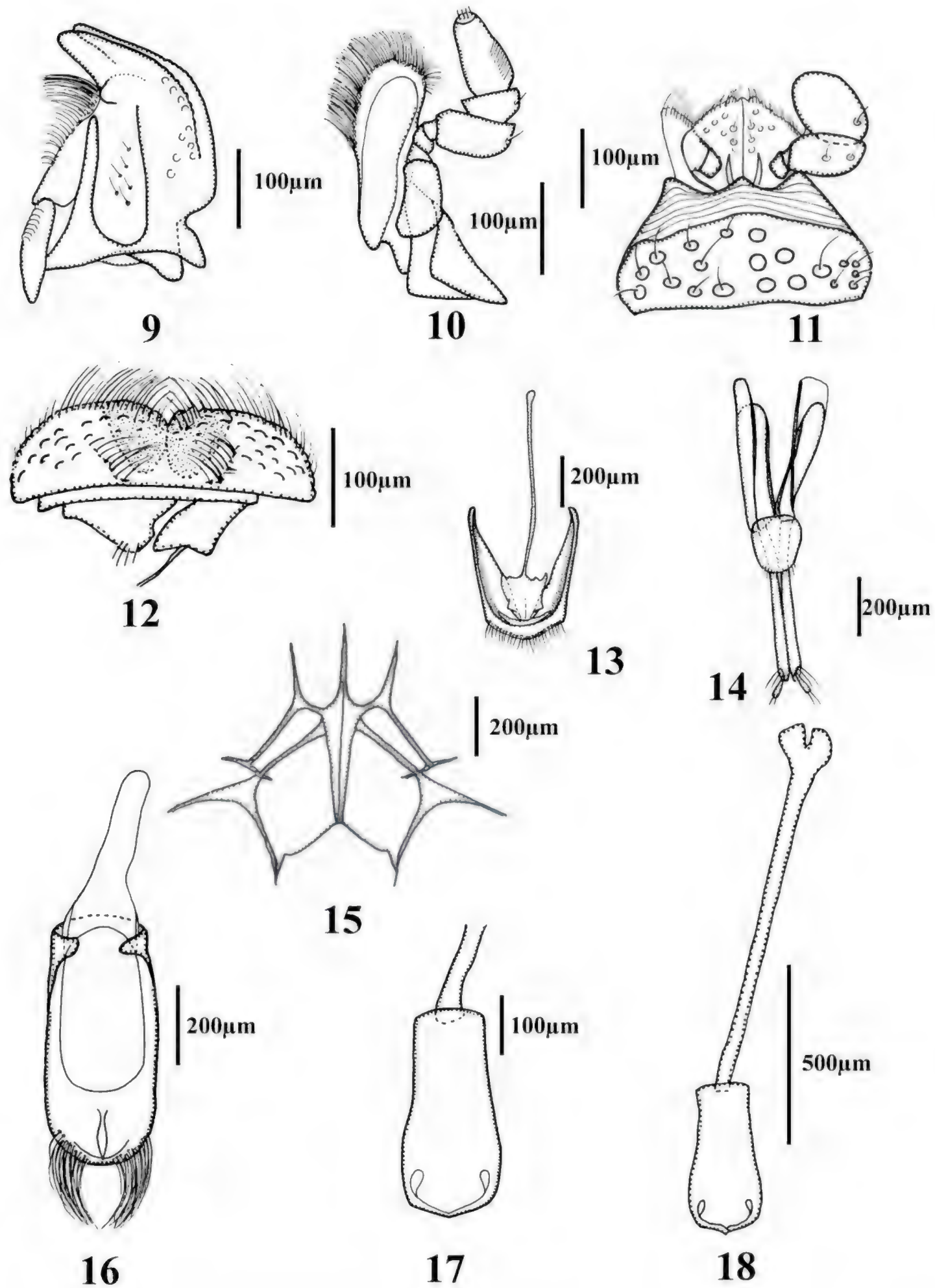


PLATE II. Figs. 9–18. *Ipidia variolosa* Reitter, 1879: 9, Mandible, Dorsal view; 10, Maxilla, Ventral View; 11, Labium, Ventral view; 12, Labrum, Dorsal view; 13, Spiculum gastrale and last abdominal ventrite, Ventral view; 14, Ovipositor, Ventral view; 15, Metendosternite; 16, Male genitalia: Tegmen, Ventral view; 17, Male genitalia: Median lobe, Ventral view; 18, Male genitalia: Median lobe along with median strut.

surface distinctly punctate, punctures of two types- large, about 3x as large as those on vertex, separated by 0.5–2 diameters; large punctures, intermixed with smaller, round and dense punctures, about the size of eye facets, separated by 1–3 diameters; very fine, appressed setae on disc.

**Scutellum:** transverse, about 2x as humeral angles nearly right-angled, sides subparallel from base to apical one-fourth and gradually converging towards apex, borders explanate, apices separately rounded; punctures of two types: large, elongate-oval, closely arranged in longitudinal rows from base to apex, about 3x as large as those on vertex; these large punctures intermixed with smaller, round and dense punctures, about the size of eye facets, separated by 1–2 diameters of punctures; about nine longitudinal flat-topped interstices run from base to apex of each elytron with the 7<sup>th</sup> interstria forming a hump near humeral region of elytra; setae not visible. Abdominal tergites fully covered by the elytra. *Legs* moderately long, femora robust, tibiae with denticulate lateral edge, tarsomeres bilobed with dense setae on apical margin.

**Ventral:** side reddish-brown. Prosternal process with broadly rounded apex, reaching up to mesosternum.

**Aedeagus** (Fig. 16–18, 25): Tegmen broadly elongate with rounded apex, spatula-shaped with a dense tuft of setae arising from the ventral face of the apical margin, on either side of the middle of apex. Median lobe pear-shaped, apically broad, somewhat narrower at the base, with apex broadly rounded, slightly pointed at the middle and a distinct median strut extending from the base of the median lobe.

**Measurements (in mm.):** Total length 3.66–5.24, width of head across eyes 0.59–0.73, length of antenna 0.88–1.14, length and width of prothorax 1.35–1.44 and 2.31–2.51, length and width of elytra 2.31–3.19 and 1.85–2.47.

**Material examined:** 18 ex. INDIA: Arunachal Pradesh, Rotung, 1400 ft. (427m.), Abor Expedition, 1 ex., 07–08.iii. 1912, S. W. Kemp, ex. under bark, Det. by Grouvelle (ZSIC); L. Subansiri Survey, 4km-O-Kimin, 4 ex, 21.ix.1988, T. K. Pal and party, ex: under bark;

Namdapha Survey, Zero camp, 5 ex, 08.v.1981, S. Biswas and party (ZSIC); Namdapha, Tirap Distt., Gibbon's land, 2 ex, 31.xii.1983, S. Biswas and party (ZSIC); Namdapha Survey, Deben, 27 km. E-o-Miao, Tirap Distt., 3 ex, 05.xii.1983 (ZSIC); Assam, Dibrugarh, Abor Expedition, 1 ex., 11–19.xi.1911, S. W. Kemp [Reg. No. 2551/19] (ZSIC); West Bengal, Jalpaiguri Distt., Lankapara, 2 ex, 27.viii.1986, T. K. Pal and party, ex: under bark (ZSIC); West Bengal, Jalpaiguri Distt., Gairkata, 2 ex., 31.x.1976, Collector- Unknown (ZSIC).

**Distribution:** INDIA: Assam [New Record], West Bengal [New Record], Arunachal Pradesh; MYANMAR; THAILAND; VIETNAM; TAIWAN; JAPAN; KOREA; CHINA; RUSSIA.

**Subgenus *Ipidia* (*Hemipidia*) Kirejtshuk, 1992**  
**Diagnostic characters:**

Body oval, less than twice as long as wide, prothorax at least twice as wide as long. Sides of elytra smoothly rounded, their 7<sup>th</sup> interstria hardly more distinct than others, elytral punctures variable.

## 2. *Ipidia* (*Hemipidia*) *sjoeborgi* Jelínek, 1978

*Ipidia sjoeborgi* Jelínek, 1978: 199.

*Ipidia* (*Hemipidia*) *sjoeborgi*: Kirejtshuk, 1992: 64.

**Diagnosis** (Fig. 19, 21) oblong-ovate, moderately convex and shiny, colour testaceous brown to dark brown, lateral margin moderately explanate, presence of feebly convex and slightly ribbed longitudinal interstices on each elytron almost parallel to each other and converging towards apex; coarsely punctate cuticle; very fine, tiny, sparse, white, closely appressed setae present near the lateral edges of dorsum.

**Head:** transverse, exposed part about 1.4x as broad as long, distinctly narrower than prothorax, frons somewhat depressed; punctures on vertex round, about twice as large as those of eye facets; punctation on frons round, distinct, diameter about twice as large as those of vertex, separated by about 0.25–0.5 diameter of punctures; eyes moderately large and laterally



# PLATE- III

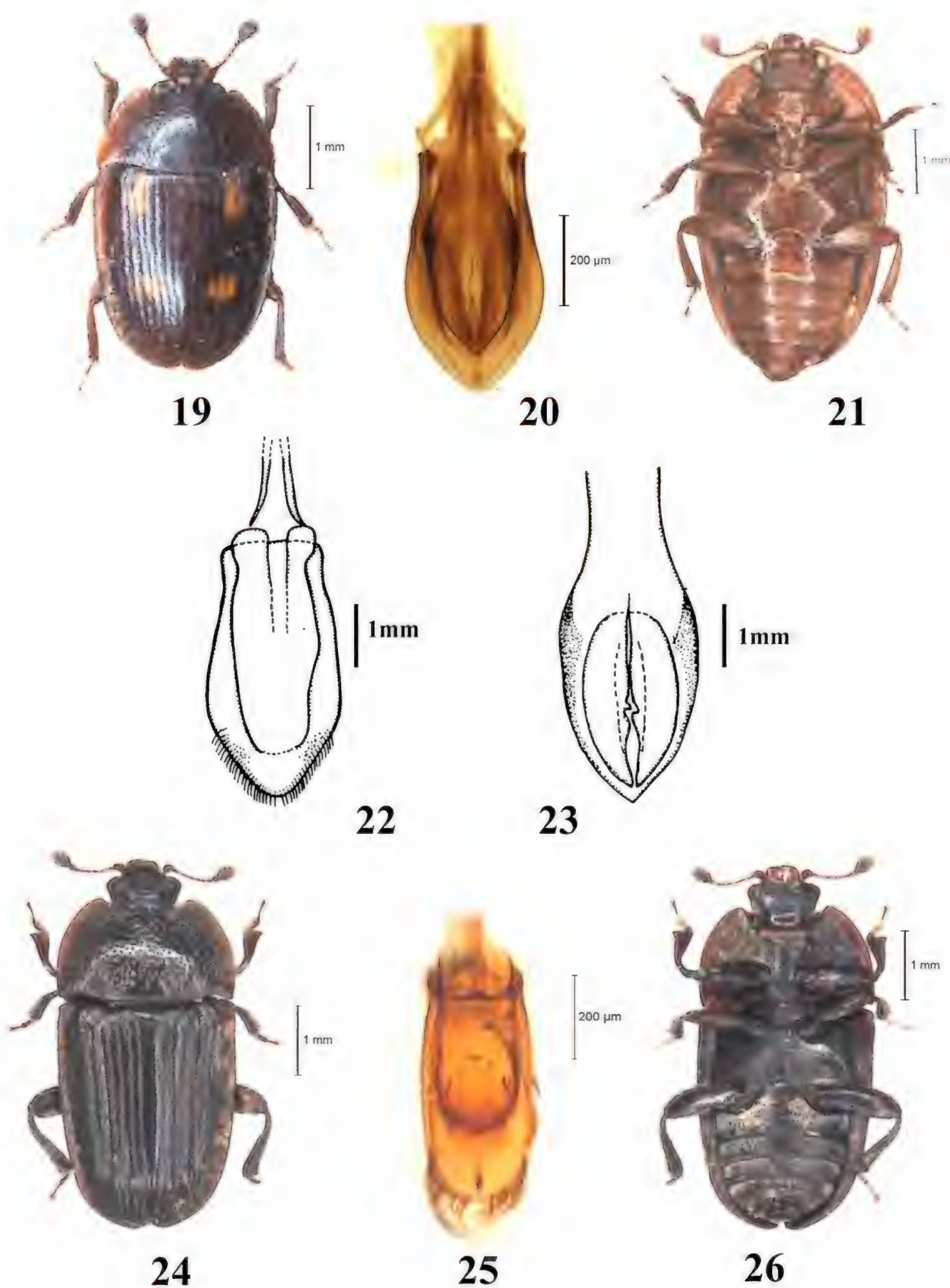


PLATE III. Figs. 19–26. *Ipidia sjoebergi* Jelínek, 1978: 19, Dorsal view (photograph); 20, Male genitalia (photograph); 21, Ventral view (photograph); 22, Male genitalia: Tegmen, Ventral view; 23, Male genitalia: Median lobe, Ventral view; 24–26. *Ipidia variolosa* Reitter, 1879: 24, Dorsal view (photograph); 25, Male genitalia (photograph); 26, Ventral view (photograph).

projected, about 0.4x as long as head, outer margin rounded, coarsely faceted; temple indistinct; few short, white, appressed setae on head. Antenna about 1.9x as long as head; antennal club about 1.3x as long as broad, club segments compact, about 0.3x as long as antenna. *Prothorax* transverse (1.0:2.0), about twice as broad as long, anterior margin broadly emarginate; sides arcuate, posterior margin bisinuate, anterior angles obtuse, posterior angles rather sharply pointed. Pronotum subconvex, surface distinctly punctate, punctures of two types- large, round, scattered, about as large as those on frons, separated by 0.5–2 diameters; large punctures intermixed with smaller punctures, about the size of eye facets, separated by 1–2 diameters; very fine, appressed setae on disc.

**Scutellum:** transverse, about 1.7x as broad as long, triangular and somewhat rounded apically; finely punctate, punctures about half the size of eye facets, setae indistinct. *Elytra* about 1.1x as long as broad, anterior margin closely fit with posterior margin of prothorax, humeral angles nearly right-angled, sides arcuate, borders moderately explanate, apices separately rounded; punctures of two types: minute, round, about as large as the eye facets, separated by 0.25–0.5 diameters, arranged in longitudinal rows; these punctures intermixed with smaller, round and scattered punctures, about half the size of large punctures, separated by 1–2 diameters; setae fine, short, sparse, appressed and posteriorly directed; interstices feebly convex and slightly ribbed. Abdominal tergites usually fully covered by the elytra. *Legs* moderately long, femora robust, tibiae with denticulate lateral edge, apical margin bears spicules, tarsomeres with dense setae on apical margin. Mid and hind legs bear two longitudinal rows of setae running from base to apex of tibiae.

**Ventral side:** reddish-brown. Prosternal process with broadly rounded apex, reaching upto mesosternum.

**Aedeagus** (Fig. 20, 22, 23): Tegmen broadly elongated, slightly expanded laterally behind middle and then gradually tapering towards apex, spoon-shaped with small and fine setae arranged on the ventral face of the apical margin, tegminal struts join together anteriorly

making a V-shaped ring around the median lobe. Median lobe leaf-shaped, narrow at apex and broad at base, with apex pointed, a median strut extending from the base of median lobe.

**Measurements (in mm):** Total length 3.62, width of head across eyes 0.62, length of antenna 0.88, length and width of prothorax 1.01 and 2.12, length and width of elytra 2.31 and 2.15 (n=1).

**Material examined:** 3 ex., INDIA: Meghalaya, Garo Hills, above Tura, 3500–3900 ft. (1066–1188 m), 1 ex., 15.vii.–30.viii.1917, S. W. Kemp, *ex:* on fallen log (ZSIC); West Bengal, Darjiling Distt., Garubathan, 2 ex., 10.iv.1976, A. R. Bhowmick & party, *ex:* under bark (ZSIC).

**Distribution:** INDIA: Meghalaya (Garo Hills) [New Record], West Bengal (Darjiling); NEPAL; BHUTAN; MALAYSIA (Borneo); INDONESIA (Java); TAIWAN.

### Concluding remarks

*Ipidia* is comparatively a small genus with very few representatives recorded from India. Of these, majority were found from North-eastern states of India. *Ipidia* is closely related morphologically to another genus, *Stelidota* Erichson, 1843 by its elytral striations and body shape but can be differentiated from the latter by its feebly emarginate labrum, third antennomere at the most 2x as long as broad, prosternal process flatly rounded at apex and arcuate coxal lines on metaventrite [*vs.*, deeply emarginate labrum, third antennomere more than 2.5x as long as broad, prosternal process rounded at apex, coxal lines on metaventrite angulate in *Stelidota* Erichson, 1843]. A detailed comparison of these genera would be cited while dealing with the Indian fauna of *Stelidota* Er. in near future.

### Acknowledgements

The authors are grateful to the Director, Zoological Survey of India (ZSI) for providing necessary facilities to carry out the work. Dr. V. D. Hegde and Dr. M. E. Hassan, Scientist- D, ZSI extended constant support and co-operation.

### References



- Bach, M. 1851. Käferfauna für Nord- und Mitteldeutschland, mit besonderer Berücksichtigung der preussischen Rheinlande. Zweiter Band. Lieferung I. J. Hölscher, Coblenz. 413 pp.
- Erichson, W.F. 1843. Versuche einer systematischen Eintheilung der Nitidularien. Germar Zeitschrift für die Entomologie 4: 225–361.
- Erichson, W.F. 1845. Naturgeschichte der Insecten Deutschlands. Erste Abtheilung. Coleoptera. Dritter Band, 3(1). Nicolaischen Buchhandlung, Berlin. vii + [2] + 968 pp., 1 pl.
- Everts, J.D.E. 1881. Bijdrage tot de kennis der nitidularien. Tijdschrift voor Entomologie uitgegeven door De Nederlandsche Entomologische Vereeniging, 24: 9–60, pl. 2, 3, 4.
- Everts, J.D.E. 1898. Nitidulidae, pp. 467–496. *In: Coleoptera Neerlandica de Schildvleugelige Insecten van Neerland en het Aangrenzend Gebied. Vol. 1, Martinus Nijhoff, Hague.*
- Ganglbauer, L. 1899. Die Käfer von Mitteleuropa. Die Käfer der österreichisch-ungarischen Monarchie, Deutschlands, der Schweiz, sowie des französischen und italienischen Alpengebietes. Familienreihe Clavicornia. Volume III. C. Gerald's Sohn, Wien. iii + 1046 pp.
- Grouvelle, A. 1913. Nitidulidae, pp. 8–223. *In: Junk, W. & Schenkling, S. (eds.). Coleopterorum Catalogus, pars 56., W. Junk, Berlin.*
- Guttfleisch, V. and Bose, F. C. 1859. Die Käfer Deutschlands von Valentin Guttfleisch, nach des Verfassers Tode. Diehl, Darmstadt. 661 pp.
- Jacquelin du Val, P.N.C. 1858. Famille des Nitidulides, pp. 134–160. *In: Manuel Entomologique. Genera des Coléoptères d'Europe. Vol. 2. A. Deyrolle, Paris.*
- Jelínek, J. 1965. The Palaearctic species of genera *Ipidia* Er. and *Stelidota* Er. (Coleoptera, Nitidulidae). Acta Entomologica Bohemoslovaca, 62: 210–223.
- Jelínek, J. 1978. Ergebnisse der Bhutan-Expedition 1972 des Naturhistorischen Museums in Basel. Coleoptera: Fam. Nitidulidae. Entomologica Basiliensia 3: 171–218.
- Jelínek, J. and Audisio, P. 2007. Nitidulidae, pp. 459–491. *In: Löbl, I. & Smetana, A. (eds.). Catalogue of Palaearctic Coleoptera. Part 4, Apollo Books, Stenstrup.*
- Kirejtshuk A.G. 1992. 59, 61. Sem. Nitidulidae – Blestyaniki, pp. 114–209. *In: Ler P. A. (ed.). [Key to the insects of the Far East of the USSR in six volumes. Volume III. Coleoptera]. Zhestkokrylye, Hi zhuki, Nauka, St. Petersburg. [in Russian]*
- Kirejtshuk, A.G. 2005. On the fauna of Nitidulidae (Insecta, Coleoptera) from Taiwan with some taxonomical notes. Annales Historico-Naturales Musei Nationalis Hungarici 97: 51–113.
- Kirejtshuk, A.G. 2008. A current generic classification of sap beetles (Coleoptera, Nitidulidae). Zoosystematica Rossica 17(1): 107–122.
- Lacordaire, T. 1854. Coléoptères, pp. 1–548. *In: Histoire Naturelle des Insectes. Vol. 2, Librairie Encyclopédique de Roret, Paris.*
- Latreille, P. A. 1802. Histoire naturelle, générale et particulière des crustacés et des insectes. Ouvrage faisant suite aux oeuvres de Leclerc de Buffon, et partie du Cours complet d'Histoire naturelle rédigé par C. S. Sonnini, membre de plusieurs Sociétés savantes. Tome troisième. F. Dufart, Paris. x + 467 + [1] pp.
- Marseul, S. 1885. Précis des genres et espèces de la tribus Nitidulides de l'Ancien Monde. L'Abeille 23: 19–142.
- Redtenbacher, L. 1845. Die Gattungen der deutschen Käfer-Fauna nach der analytischen Methode bearbeitet. Überreuter, Wien. 177 pp. + 2 pls.
- Redtenbacher, L. 1849. Fauna Austriaca- Die Käfer, nach der analytischen Methode bearbeitet. ed. I. Gerold, Wien. xxvii + 883 pp.
- Redtenbacher, L. 1858. Fauna Austriaca- Die Käfer, nach der analytischen Methode bearbeitet. ed. II. Gerold, Wien. cxxxvi + 1017pp. + 2 pl.
- Redtenbacher, L. 1874. Fauna Austriaca- Die Käfer, nach der analytischen Methode bearbeitet. Dritte, gänzlich umgearbeitete und bedeutend vermehrte Auflage. C.

- Gerold's Sohn, Wien. cliii + 564 + 725 + viii pp., 2 pls.
- Reitter, E. 1873. Systematische Einteilung der Nitidularien. Verhandlungen des naturforschenden Vereines in Brünn, 12(1): 5–194.
- Reitter, E. 1875. Die europäischen Nitidularien mit kurzer Charakteristik der Gattungen und Bemerkungen über schwierige Arten verzeichnet. Deutsche Entomologische Zeitschrift, 19(3): 1–30.
- Reitter, E. 1879. Verzeichniss der von H. Christoph in Ost-Sibirien gesammelten Clavicomier etc. Deutsche Entomologische Zeitschrift, 23: 209–226.
- Reitter, E. 1884. Die Nitiduliden Japans. Wiener Entomologische Zeitung, 3: 257–302, 299–302 and 4: 15–18, 39–44, 75–80, 101–104, 141–142, 173–175.
- Reitter, E. 1911. Fauna Germanica. Die Käfer des Deutschen Reiches. Nach der analytischen Methode bearbeitet. III. Band. K. G. Lutz, Stuttgart. 436 pp. + pls. 81–128.
- Seidlitz, G.K.M. 1872. Fauna Baltica. Die Käfer der deutschen Ostseeprovinzen Russlands. H. Laakmann, Dorpat. 560 pp.
- Seidlitz, G.K.M. 1888a. Fauna Baltica. Die Käfer der deutschen Ostseeprovinzen Russlands. Hartung'sche Verlagsdruckerei, Königsberg. 10 + lvi + 192 + 818 pp.
- Seidlitz, G.K.M. 1888b. Fauna Transsylvanica. Die Käfer, Coleoptera Siebenbürgens. Hartung'sche Verlagsdruckerei, Königsberg. lvi + 192 + 915 pp. [in German]
- Stierlin, W.G. 1900. Fauna coleopterorum helvetica. Die Käfer-Fauna der Schweiz nach analytischen Methode bearbeitet. I. Theil. Balli & Böcherer, Schaffhausen. 667 pp.
- Thomson, C.G. 1859. Skandinaviens Coleoptera, synoptiskt bearbetade. Tom. I. Berlingska, Lund. [6] + 290 pp.
- Thomson, C.G. 1862. Skandinaviens Coleoptera, synoptiskt bearbetade. Tom. IV. Lundbergska Boktryckeriet, Lund. 268 pp.
- Thomson, C.G. 1867. Skandinaviens Coleoptera, synoptiskt bearbetade. Tom IX. Lundbergska Boktryckeriet, Lund. 407 pp.



# A new species of *Hercostomoides* Meuffels et Grootaert, 1997 from Indonesia with notes and new combinations for some Oriental Sympycninae (Diptera: Dolichopodidae)

Igor Ya. Grichanov

All-Russian Institute of Plant Protection, Podbelskogo 3, 196608, St.Petersburg-Pushkin, Russia.

(Email: grichanov@mail.ru)

## Abstract

The formerly Oriental genus *Hercostomoides* Meuffels et Grootaert, 1997 is recorded from the Australasian Region for the first time. A new species *Hercostomoides bhartii* sp. n. from Papua Province of Indonesia is described. *Hercostomoides indonesianus* (Hollis, 1964) and *Telmaturgus acutatus* (Yang et Grootaert, 1999) are recorded from India for the first time. The following re-combinations (comb. nov.) are proposed: *Chaetogonopteron acuticorne* (Frey, 1928) (*Pycsymnus*), *C. albifimbriatum* (Parent, 1932) (*Sympycnus*), *C. apicale* (De Meijere, 1916) (*Sympycnus*), *C. appendicitum* (Parent, 1932) (*Sympycnus*), *C. argentipes* (De Meijere, 1916) (*Sympycnus*), *C. argyropus* (Parent, 1932) (*Sympycnus*), *C. arunense* (Hollis, 1964) (*Sympycnus*), *C. bisulcum* (Becker, 1922) (*Sympycnus*), *C. coei* (Hollis, 1964) (*Sympycnus*), *C. collectum* (Walker, 1857) (*Dolichopus*) [= *C. triplex* (Becker, 1922) (*Sympycnus*)], *C. gloriosum* (Frey, 1925) (*Pycsymnus*), *C. gummigutti* (Becker, 1922) (*Sympycnus*), *C. luteoviride* (Parent, 1932) (*Pycsymnus*), *C. maculatum* (Parent, 1932) (*Pycsymnus*), *C. magnificum* (Parent, 1935) (*Sympycnus*), *C. majus* (De Meijere, 1916) (*Sympycnus*), *C. metallescens* (De Meijere, 1916) (*Sympycnus*), *C. minutulum* (Parent, 1932) (*Sympycnus*), *C. nodicorne* (Becker, 1922) (*Sympycnus*), *C. strenuum* (Becker, 1922) (*Sympycnus*), *C. tenerum* (Becker, 1922) (*Sympycnus*), *C. thienemanni* (Stackelberg, 1931) (*Pycsymnus*), *C. vermiculatum* (Parent, 1932) (*Pycsymnus*), *Telmaturgus acutatus* (Yang et Grootaert, 1999) (*Chaetogonopteron*), *T. chebalingensis* (Wang, Yang et Grootaert, 2005) (*Chaetogonopteron*), *T. concavus* (Yang et Grootaert, 1999) (*Chaetogonopteron*), *T. dorsiniger* (Yang et Grootaert, 1999) (*Chaetogonopteron*), *T. revanasiddaiahi* (Olejníček, 2002) (*Chaetogonopteron*), *T. shettyi* (Olejníček, 2002) (*Chaetogonopteron*), *T. simplicipes* (Becker, 1908) (*Sympycnus*) [= *T. tenuemarginatus* (Strobl, 1909) (*Teuchophorus*)], [= *T. turbidus* (Becker, 1922) (*Sympycnus*)], [= *T. basalis* (Curran, 1926) (*Syntormoneura*)], [= *T. placidus* (Curran, 1926) (*Sympycnus*)], [= *T. luteicinctus* (Parent, 1926) (*Sympycnus*)], [= *T. apiciniger* Yang et Grootaert, 1999 (*Chaetogonopteron*)], *T. singularis* (Yang et Grootaert, 1999) (*Chaetogonopteron*).

**Keywords:** *Hercostomoides*, *Chaetogonopteron*, *Sympycnus*, *Telmaturgus*, new species, new combination, new record, Indonesia, India.

Received: 17 March 2017; Revised: 29 June 2017; Online: 30 December 2017.

## Introduction

The genus *Hercostomoides* Meuffels et Grootaert, 1997 is a monotypic genus of the subfamily Sympycninae. It accommodates a single species, *H. indonesianus* (Hollis, 1964) known previously from eastern Oriental Region. The genus was placed in the subfamily Sympycninae, sharing most of the hypopygial structures with *Chaetogonopteron* De Meijere, 1914, *Sympycnus* Loew, 1857, *Syntormon* Loew, 1857, and *Teuchophorus* Loew, 1857 (Meuffels and Grootaert, 1997a; Grichanov, 2011a, b). Treating the collection of the Zoological Museum of Moscow State University, Moscow, Russia, I have found an

additional undescribed species of *Hercostomoides* collected in the Papua Province of Indonesia. Consequently, the genus is recorded here for the first time from the Australasian Region. This paper presents also new records of *H. indonesianus* and *Telmaturgus acutatus* (Yang et Grootaert, 1999) from the Orissa and West Bengal, states of India; new records for *Telmaturgus simplicipes* (Becker, 1908) and new combinations for some Oriental sympycnine species.

## Material and Methods

A new *Hercostomoides* species discovered is described here and illustrated with a Zeiss Discovery V-12 stereomicroscope and an AxioCam MRc5 camera. Morphological terminologies mainly follow Cumming and Wood (2009). Body length is measured from the base of the antenna to the posterior tip of epandrium. Wing length is measured from the base to the wing apex. The types of new species and other materials examined are housed at the Zoological Museum of Moscow State University, Moscow, Russia (ZMUM) and at the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZIN). Information on collecting circumstances and permits is not available from the ZMUM collection. General distribution of species is given after Grichanov (2014).

## TAXONOMY

**Genus** *Hercostomoides* **Meuffels et Grootaert, 1997**

**Remarks:** See Meuffels et Grootaert (1997a) for diagnosis of the genus *Hercostomoides*. The genus was created for *Telmaturgus indonesianus* Hollis, 1964, and compared with the genus *Telmaturgus* because of the bulging roof-like female clypeus on head in both genera. The authors (Meuffels et Grootaert, 1997a) also noted dorsally setose antennal scape in that species, the main character of the genera of the subfamily Dolichopodinae including *Hercostomus* Loew, 1857. Nevertheless, the setose scape is present in species of the sympycnine genera *Anepsiomyia* Bezzi, 1902, *Ceratopos* Vaillant, 1952, in some species of *Syntormon* Loew, 1857 and genera of some other subfamilies. The broad bulging face is a female secondary sexual character (FSSC) found in *Syntormon* and *Ceratopos*, in some species of *Teuchophorus*. Almost all characters included in the original description of *Hercostomoides* are characteristic of the *Syntormon* generic concept (keeping in mind the variability of body colour, antenna morphology and male leg ornamentation in *Syntormon* species). In addition, I noticed the presence of fine hairs on metaepimeron of *Hercostomoides* species, the main character distinguishing *Syntormon* from the closely related genus *Parasyntormon* Wheeler, 1899 (Speight et al., 1995).

However, I prefer to save the generic position of *Hercostomoides* with the following diagnostic characters: distal sections of veins  $M_{1+2}$  and  $R_{2+3}$  are distinctly divergent (achalcine-like) in both sexes; antennal pedicel (seen on inside face) is slightly projecting into the postpedicel; postpedicel is rounded at apex in both sexes; propleuron bears strong black bristle and few short pale hairs above fore coxa; hind femur has no anterior preapical bristle. *Syntormon* representatives never have divergent veins  $M_{1+2}$  and  $R_{2+3}$ , their pedicel is usually strongly projecting into the postpedicel; postpedicel has acute or pointed apex in at least males; propleuron bears several pale hairs or setae of about equal length on lower portion; hind femur usually bears anterior preapical bristle.

The sympycnine genera with the setose dorsally antennal scape (in all or some species) can be distinguished by use of the following key:

1. Distal sections of wing veins  $M_{1+2}$  and  $R_{2+3}$  distinctly divergent in both sexes; propleuron bearing strong bristle in addition to few short pale hairs above fore coxa (Oriental, New Guinea).....*Hercostomoides*
- Distal sections of wing veins  $M_{1+2}$  and  $R_{2+3}$  parallel or convergent; propleuron without strong bristle, bearing several pale hairs or setae of about equal length above fore coxa.....2
2. Antennal postpedicel with almost basal arista-like stylus, tapering to a rounded tip; male fore femur and tibia finely spinose beneath (West Palaearctic)....*Anepsiomyia*
- Antennal postpedicel with apical or subapical arista-like stylus (dorsal to dorsoapical in females), usually pointed at tip; male fore femur and tibia rarely setose beneath ..... 3
3. Crossvein *dm-cu* straight, forming nearly right angle with longitudinal wing axis; male arista-like stylus simple; male eyes not contiguous (Cosmopolitan).....*Syntormon*
- Crossvein *dm-cu* sinuate and unusually angled in both sexes; arista-like stylus bearing apical flag in male; male eyes joined across the face (West Palaearctic) .....*Ceratopos*

***Hercostomoides bhartii* Grichanov sp. n.**  
(Figs. 1–6)



[urn:lsid:zoobank.org:act:70591529-98D9-4B75-AB04-B539F01B462A](https://zoobank.org/act:70591529-98D9-4B75-AB04-B539F01B462A)

**Description:** *Male: Head* (Fig. 1): Vertex and frons metallic black-violet with weak grey pruinosity; setae black; strong verticals, strong diverging ocellars present; 2 short postverticals in row with postocular setae; lower postoculars black; face narrowed beneath antennae, at middle half as wide as face under antennae; face black, grey pollinose, and clypeus covered with dense white pruinosity and distinctly separating eyes; frontal-clypeal suture evident; eye facets uniform; antenna black; scape setose dorsally; pedicel asymmetrical, medianly with thumb-like projection; postpedicel large, trapezoidal, 1.4 times longer than basal height; arista-like stylus middorsal, simple, with distinct hairs; length ratio of scape to pedicel to postpedicel to stylomeres 1 and 2 (in mm), 0.08/0.08/0.18/0.09/0.47; proboscis black; palpus dark yellow, with black seta and pale hairs.

**Thorax:** Black, grey pollinose, mesonotum slightly shining; 2-3 small setae in front of posterior spiracle; metaepimeron with row of white hairs; setae black; 1 strong propleural bristle below; acrostichals uniseriate, well developed; 5 strong dorsocentrals present decreasing in length anteriorly; median scutellar seta strong, lateral seta very small.

**Legs:** Mostly yellow-brown; fore and hind coxae brown; mid coxa black; fore femur at base and mid femur mostly brown; hind femur blackish dorsally; tibiae and basitarsi dark yellow, and tarsi brown to black from tip of basitarsus; leg vestiture black; fore coxa with short anterior hairs and 4-5 distolateral setae; mid coxa with short anterior setae and bristle at apex; hind coxa with lateral bristle at 1/2; fore femur with posteroventral preapical seta; fore tibia with short but distinct anterodorsal setal serration along distal half; tarsomeres 3 to 5 with erect to semierect dorsal setae, longest on segment 4 (MSSC); mid femur ventrally bare, with anterior and posteroventral preapical bristles; mid tibia with 3 anterodorsals, 2 posterodorsals, 1 anteroventral, and apical circlet of bristles; hind femur without preapical setae; hind tibia with 3 anterodorsals, 4 posterodorsals, with row of fine ventral setae, and apical circlet of bristles; hind basitarsus with ventral row of 6

setae, as long as tarsomere diameter; tarsomeres 2-3 with ventral row of spinules; podomeres (from tibia to fifth tarsomere) length ratio (in mm): fore leg: 0.69/0.39/0.18/0.14/0.11/0.10, mid leg: 1.03/0.46/0.24/0.17/0.10/0.11, hind leg: 1.24/0.29/0.26/0.18/0.12/0.12.

**Wing:** Membrane hyaline; anal angle weak; veins brown;  $R_{4+5}$  and M diverging from base to wing margin, with M ending slightly behind wing apex; cross-vein dm-cu slightly convex; ratio of costal section between  $R_{2+3}$  and  $R_{4+5}$  to that between  $R_{4+5}$  and  $M_{1+2}$  (in mm): 0.3/0.26; basal section of  $M_{1+2}$  shorter than distal section; ratio of cross-vein dm-cu to distal part of  $CuA_1$  (in mm): 0.19/0.37; lower calypter brown, with black cilia; halter black.

**Abdomen:** Entirely black, with black setae; hypopygium small, black, with black surstylus and cercus.

**Measurements** (mm): Body length 1.9-2.1, wing length/width 2.1/0.7, antenna length 0.75.

**Female:** unknown.

**Material examined:** *Holotype*. ♂, Indonesia: W Papua, Wamena, Baliem Resort env., 4.06°S, 139.03°E, 2000 m, 16–25.XII. 2014, N. Vikhrev [ZMUM]. *Paratypes*. 3♂, same data [ZIN, ZMUM].

**Diagnosis:** The new species is close to *Hercostomoides indonesianus*, differing from the latter in entirely black antenna, trapezoidal shape of postpedicel, black body, much darker legs, black halteres etc. *H. indonesianus* individuals have mainly yellow antenna on ventral side, elongate-ovate postpedicel, yellow-brown thorax and abdomen, yellow halteres and hypopygium, yellow legs including fore and mid coxae.

**Etymology:** This species is named in honor of well-known entomologist Dr. Himender Bharti (Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India).

#### New records

*Hercostomoides indonesianus* (Hollis, 1964)  
=*Telmaturgus indonesianus* Hollis, 1964a: 264  
(Figs. 7–10)



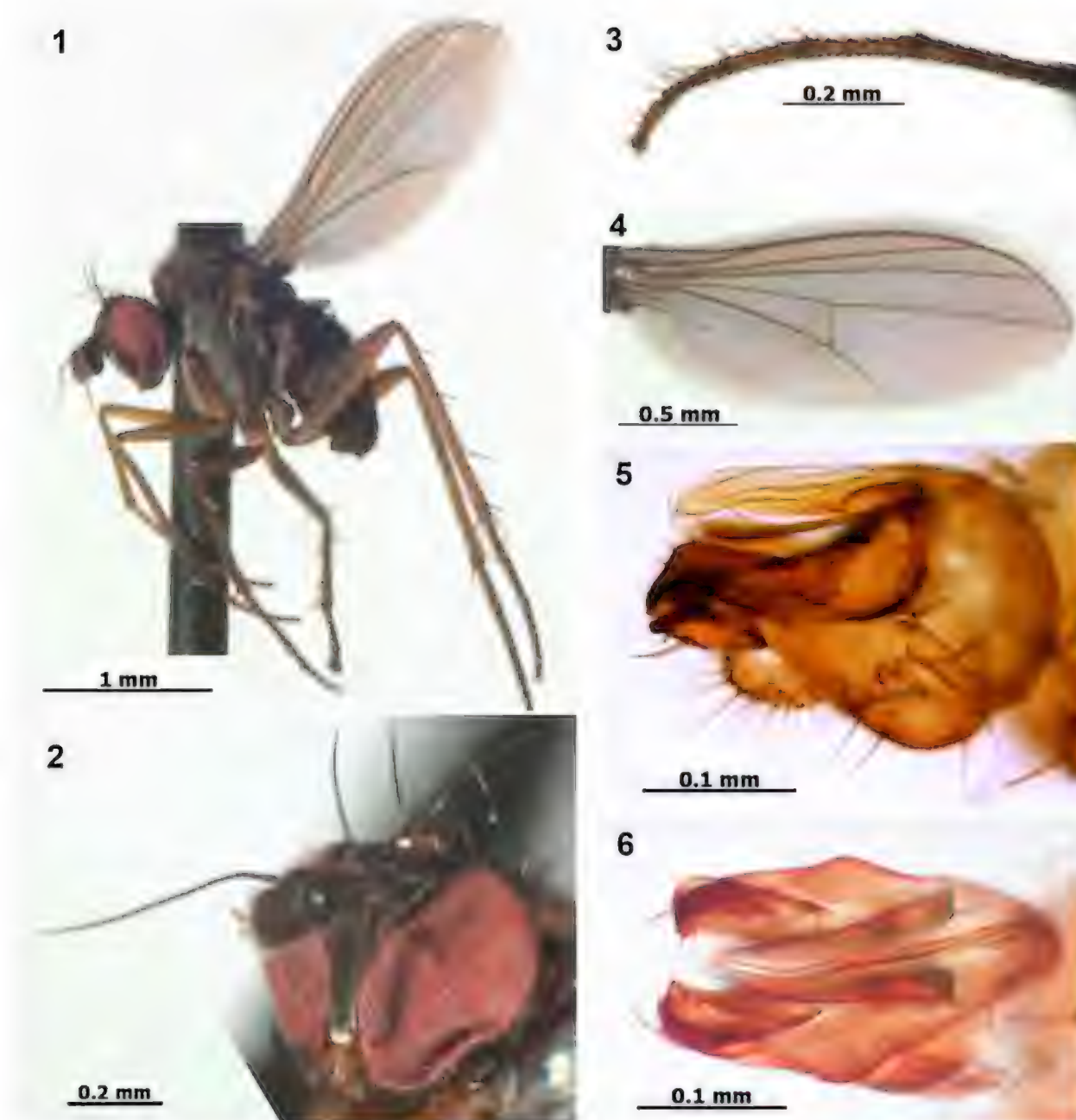


Fig. 1-6. *Hercostomoides bhartii* Grichanov, sp. n. (male): 1. Habitus; 2. Head; 3. Fore tarsus; 4. Wing; 5. Hypopygium, lateral view; 6. Hypopygium, ventral view

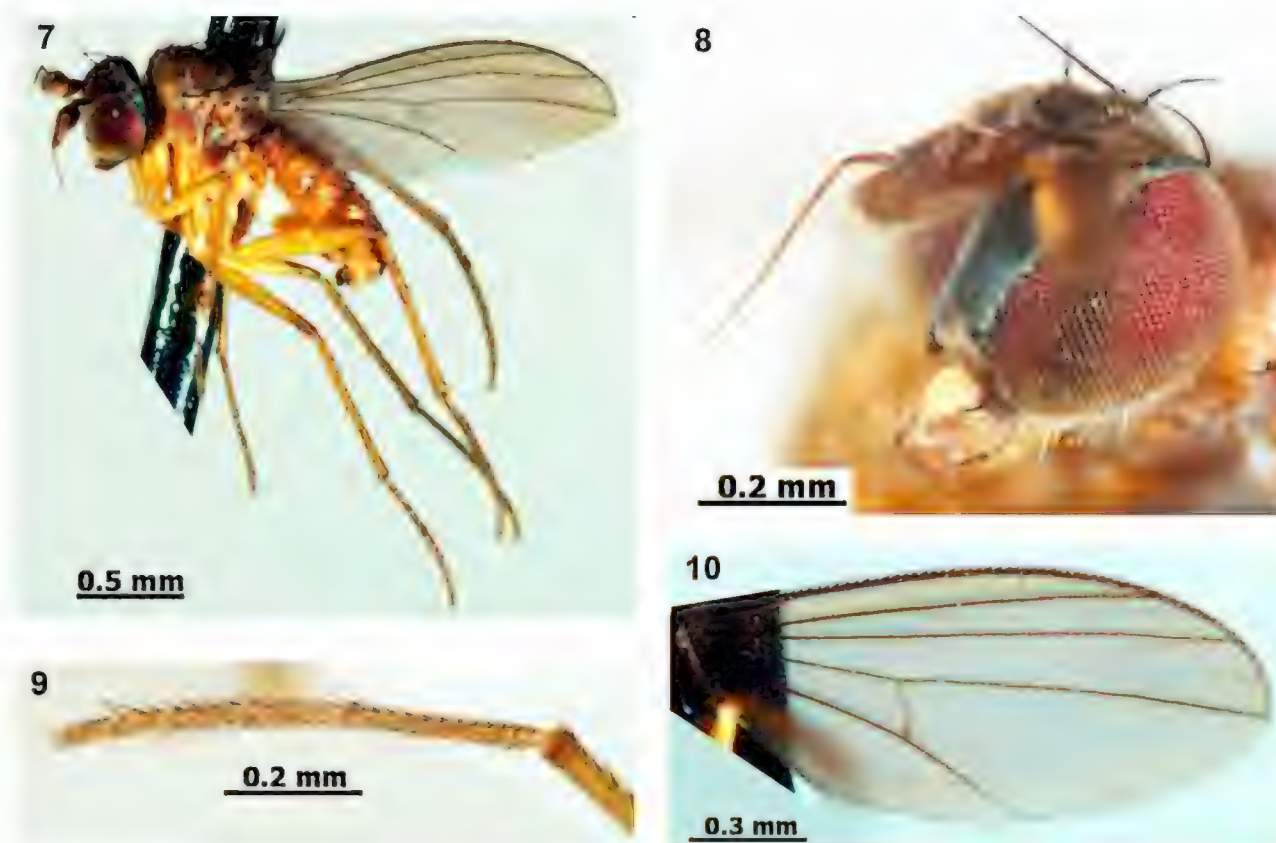


Fig. 7-10. *Hercostomoides indonesianus* (Hollis, 1964) (male): 7. Habitus; 8. Head; 9. Fore tarsus; 10. Wing



**Material examined:** 1♂, **India:** Orissa, Gop, 19.982°N, 86.016°E, 8-9.i.2014, K. Tomkovich [ZMUM]; 1♂, **Thailand:** S Pattaya, 26.xi.2006, N. Vikhrev [ZMUM]; 1♂, Mae Hong Son Prov., Pai, 19.3583°N, 98.4468°E, 500 m a. s. l., 15-24.xii.2010, K. Tomkovich [ZIN]; 1♂, Chon Buri, Ban Kled, beach Sai Kaew, 12.44.5411°N, 100.50.4646°E, 16.xi.2006, A.L. Ozerov [ZMUM]; 1♂, **Malaysia:** Sabah st., Beringgis beach, 5.79°N, 115.99°E, 19-26.ii.2014, N. Vikhrev [ZMUM].

**Distribution:** China (Guangdong, Guangxi, Hainan, Zhejiang), Indonesia (Java, Sumatra), Malaysia (Sarawak), Philippines, Singapore, Thailand, Vietnam. New species for India.

### New combinations

Looking for relatives of *Hercostomoides* species in old literature within the closest sympycnine genera, I have found many misidentifications of known species at the generic level. I establish here new combinations for the described species in order to facilitate future revision of the subfamily Sympycninae in the Oriental Region. The replacements are based on clearly pronounced and illustrated male and female secondary sexual characters (MSSC and FSSC) of generic importance that do not require study of type material. The main confusion in the subfamily is related with the *Chaetogonopteron* (= *Pycsymnus* Frey, 1925), *Sympycnus* and *Telmaturgus* generic concepts. See Grichanov (2011a) and Yang *et al.* (2011) for an identification keys to these and other sympycnine genera. The listed and closely related sympycnine genera *Teuchophorus* and *Olegonegrobovia* Grichanov, 1995, can be distinguished by use of the following key:

1. Male anterior tarsomeres modified at least weakly, usually shortened, but with basitarsus often elongate; some of the tarsomeres often flattened or ornamented with processes, spines or remarkable hairs; last four hind tarsomeres simple, regularly decreasing in length; male hind basitarsus often ornamented with remarkable setae or hairs; female clypeus strongly bulging (Cosmopolitan).....*Telmaturgus*  
– Fore tarsomeres simple or shortened, rarely ornamented with remarkable hairs; last four hind tarsomeres of male usually irregularly

decreasing in length; male hind basitarsus rarely ornamented with remarkable setae or hairs; female clypeus not bulging (except for *Teuchophorus longifrons* Bickel, 1983, and *T. queenslandicus* Bickel, 1983) .....2

2. Two rather than one postverticals, strong ventral subapical seta on hind tibia, wing veins  $R_{4+5}$  and  $M_{1+2}$  slightly divergent rather than parallel, strongly oblique crossvein *dm-cu* forming acute (ca. 60°) angle with  $CuA_1$ ; mid femur with ventral bristles in basal part; male wing costa often with long and thick stigma beyond  $R_1$ ; epandrial foramen mostly middorsal (Cosmopolitan except for Neotropics) .....*Teuchophorus*  
– One postvertical seta; wing veins  $R_{4+5}$  and  $M_{1+2}$  parallel; epandrium with mostly left basolateral foramen; other features various.....3
3. Five pairs of strong dorsocentrals; two basal hind tarsomeres shortened; male hind tarsomere 2 with apicoventral worm-like process; tarsomere 3 longer than tarsomere 2; tarsomere 4 shorter than tarsomere 3 (Oriental, Afrotropical, Palaearctic and Australasian).....*Chaetogonopteron*  
– Usually 6, rarely 5 pairs of strong dorsocentrals; two basal hind tarsomeres not shortened; male hind tarsomere 2 never having worm-like process .....4
4. Proepisternum without setae, with microscopic hairs; male anterior tarsomeres simple; male hind tarsomere 3 shorter than 2, often bearing one or more modified setae; tarsomere 4 usually longer and thinner than 3, often polished; male anal wing lobe without strong setae; dorsal and ventral surstyli separated (Cosmopolitan) .....*Sympycnus*  
– Proepisternum with seta; male anterior tarsomeres rarely simple, usually shortened; last four hind tarsomeres regularly decreasing in length, simple; strong setae usually present at end of male anal wing lobe; dorsal and ventral surstyli fused almost to apex (Afrotropical and probably Oriental) .....*Olegonegrobovia*

### *Chaetogonopteron acuticorne* (Frey, 1928), comb. nov.

= *Pycsymnus acuticornis* Frey, 1928: 19

= *Sympycnus acuticornis* (Frey, 1928); Dyte, 1975: 254

**Remarks:** The genus *Pycsymnus* was synonymized with *Chaetogonopteron* by Meuffels *et* Grootaert (1997b). However, *Pycsymnus acuticornis* was not transferred to the latter. The species was described with male hind tarsus with short basitarsus bearing a seta and short second segment bearing a worm-like apical process along with several setae (Frey, 1928). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).

**Distribution:** Philippines.

***Chaetogonopteron albifimbriatum* (Parent, 1932), comb. nov.**

=*Sympycnus albifimbriatus* Parent, 1932a: 118

**Remarks:** The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a worm-like apical process (Parent, 1932a). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species has also a diagnostic setation on the fore leg.

**Distribution:** Indonesia (Sumbawa).

***Chaetogonopteron apicale* (De Meijere, 1916), comb. nov.**

=*Sympycnus apicalis* De Meijere, 1916: 251

**Remarks:** The species was described and illustrated with male hind tarsus with very short basitarsus and next segment, the latter bearing a remarkable process (De Meijere, 1916). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the mid leg and hind tibia.

**Distribution:** China (Taiwan), Indonesia (Java), Pakistan, Philippines.

***Chaetogonopteron appendicitum* (Parent, 1932), comb. nov.**

=*Sympycnus appendicitus* Parent, 1932a: 115

**Remarks:** The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a bifurcated apical process (Parent, 1932a). These characters clearly refer

the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore tarsus and mid tibia.

**Distribution:** Indonesia (Flores).

***Chaetogonopteron argentipes* (De Meijere, 1916), comb. nov.**

=*Sympycnus argentipes* De Meijere, 1916: 247

**Remarks:** The species was described and illustrated with male hind tarsus with very short triangular basitarsus bearing ventral seta, and very short second segment, the latter bearing a filiform sinuate apical process (De Meijere, 1916). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore leg.

**Distribution:** China (Taiwan), Indonesia (Java).

***Chaetogonopteron argyropus* (Parent, 1932), comb. nov.**

=*Sympycnus argyropus* Parent, 1932a: 119

**Remarks:** The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a worm-like apical process (Parent, 1932a). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore leg.

**Distribution:** Indonesia (Flores).

***Chaetogonopteron arunense* (Hollis, 1964), comb. nov.**

=*Sympycnus arunensis* Hollis, 1964b: 102

**Remarks:** The species was described with six strong dorsocentrals on mesonotum, male hind tarsus with short and enlarged basitarsus and next segment short and bearing a bifid lobe apico-ventrally (Hollis, 1964b). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore and mid tarsi.

**Distribution:** Nepal.

***Chaetogonopteron bisulcum* (Becker, 1922), comb. nov.**



=*Sympycnus bisulcus* Becker, 1922: 94

**Remarks:** The species was described with six strong dorsocentrals on mesonotum, simple male fore tarsus, male hind tarsus with very short and thickened basitarsus and next segment, the latter bearing an apical process (Becker, 1922). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).

**Distribution:** China (Taiwan), India, Myanmar, Philippines.

***Chaetogonopteron coei* (Hollis, 1964), comb. nov.**

=*Sympycnus coei* Hollis, 1964b: 102

**Remarks:** The species was described and illustrated with six strong dorsocentrals on mesonotum, male hind tarsus with short and enlarged basitarsus with 2 long pale hairs ventrally, next segment shorter than basitarsus and with a bilobed ventral appendage, 3rd tarsal segment longer than segments 4 and 5 together and with a ventral row of short bristles (Hollis, 1964b). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).

**Distribution:** Nepal.

***Chaetogonopteron collectum* (Walker, 1857), comb. nov.**

=*Dolichopus collectus* Walker, 1857: 121

=*Sympycnus collectus* (Walker, 1857); Parent, 1934: 9

=*Sympycnus triplex* Becker, 1922: 102; Parent, 1934: 9

=*Chaetogonopteron triplex* (Becker, 1922), comb. nov.

**Remarks:** The species was described with male hind tarsus with short basitarsus, enlarged and fringed at apex, and short second segment, the latter bearing a sinuate ornamented process (Becker, 1922). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore and mid tarsi.

**Distribution:** China (Taiwan), Malaysia.

***Chaetogonopteron gloriosum* (Frey, 1925), comb. nov.**

=*Pycsymnus gloriosus* Frey, 1925: 21

=*Sympycnus gloriosus* (Frey, 1925); Dyte,

1975: 255

**Remarks:** The genus *Pycsymnus* was synonymized with *Chaetogonopteron* by Meuffels and Grootaert (1997b). However, *Pycsymnus gloriosus* was not transferred to the latter. The species was described with male hind tarsus with short thick basitarsus bearing a thickened basal seta and short second segment bearing a worm-like apical ornamented process (Frey, 1925). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).

**Distribution:** Philippines.

***Chaetogonopteron gummigutti* (Becker, 1922), comb. nov.**

=*Sympycnus gummigutti* Becker, 1922: 95

**Remarks:** The species was described with six strong dorsocentrals on mesonotum, male hind tarsus with short and enlarged basitarsus and next segment short and bearing a worm-like process (Becker, 1922). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore and mid tarsi and tibiae.

**Distribution:** India (West Bengal), Myanmar, Nepal.

***Chaetogonopteron luteoviride* (Parent, 1932), comb. nov.**

=*Pycsymnus luteoviridis* Parent, 1932b: 230

=*Sympycnus luteoviridis* (Parent, 1932b); Dyte, 1975: 255

**Remarks:** The genus *Pycsymnus* was synonymized with *Chaetogonopteron* by Meuffels and Grootaert (1997b). However, *Pycsymnus luteoviridis* was not transferred in the latter. The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a worm-like apical process (Parent, 1932b). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species has also a diagnostic setation on the fore and mid tarsi.

**Distribution:** China (Taiwan).

***Chaetogonopteron maculatum* (Parent, 1932), comb. nov.**

=*Pycsymnus maculatus* Parent, 1932b: 231

=*Sympycnus maculatus* (Parent, 1932b);  
Dyte, 1975: 255

**Remarks:** The genus *Pycsymnus* was synonymized with *Chaetogonopteron* by Meuffels and Grootaert (1997b). However, *Pycsymnus maculatus* was not transferred in the latter. The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a worm-like apical process (Parent, 1932b). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore tarsus and mid leg, and remarkable spot on wing.

**Distribution:** China (Taiwan), Sri Lanka.

***Chaetogonopteron magnificum* (Parent, 1935), comb. nov.**

=*Sympycnus magnificus* Parent, 1935: 214

**Remarks:** The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a worm-like apical process (Parent, 1935). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore and mid tarsi.

**Distribution:** Malaysia.

***Chaetogonopteron majus* (De Meijere, 1916), comb. nov.**

=*Sympycnus major* de Meijere, 1916: 250

**Remarks:** The species was described and illustrated with male hind tarsus with short basitarsus bearing 2 ventral setae, and next segment bearing a remarkable apical process (De Meijere, 1916). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species has also a diagnostic flag on the arista-like stylus of antenna.

**Distribution:** Indonesia (Java).

***Chaetogonopteron metallescens* (De Meijere, 1916), comb. nov.**

=*Sympycnus metallescens* de Meijere, 1916: 250

**Remarks:** The species was described and illustrated with male hind tarsus with short basitarsus and next segment bearing a

remarkable apical process (De Meijere, 1916). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).

**Distribution:** Indonesia (Java, Flores).

***Chaetogonopteron minutulum* (Parent, 1932), comb. nov.**

=*Sympycnus minutulus* Parent, 1932a: 117

**Remarks:** The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a worm-like apical process (Parent, 1932a). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).

**Distribution:** Indonesia (Sumbawa).

***Chaetogonopteron nodicorne* (Becker, 1922), comb. nov.**

=*Sympycnus nodicornis* Becker, 1922: 100

=*Telmaturgus nodicornis* (Becker, 1922);  
Maslova *et al.*, 2008: 44

**Remarks:** The species type was examined by Maslova *et al.* (2008), who recombined it with *Telmaturgus* based on the presence of 4 dorsocentral bristles on mesonotum and apical flag on the arista-like stylus of male antenna. However, Becker (1922) described the male hind tarsus of his new species with short and fringed basitarsus and next segment being short and bearing a stalk-like processes. Any modification of male fore tarsus and broad female face were not mentioned by both Becker and Maslova *et al.* This complex of characters clearly refers the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).

**Distribution:** China (Taiwan).

***Chaetogonopteron strenuum* (Becker, 1922), comb. nov.**

=*Sympycnus strenuus* Becker, 1922: 101

**Remarks:** The species was described with male hind tarsus with very short and enlarged triangular basitarsus bearing a seta at middle and very short second segment bearing a worm-like process (Becker, 1922). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016).



**Distribution:** Philippines, Sri Lanka.

***Chaetogonopteron tenerum* (Becker, 1922), comb. nov.**

=*Sympycnus tener* Becker, 1922: 103

**Remarks:** The species was described and illustrated with male hind tarsus with very short basitarsus bearing a curved seta and very short second segment bearing a worm-like process and several setae at apex (Becker, 1922). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species has also a diagnostic setation on the fore and mid legs and hind tibia.

**Distribution:** China (Taiwan).

***Chaetogonopteron thienemanni* (Stackelberg, 1931), comb. nov.**

=*Pycsymnus thienemanni* Stackelberg, 1931: 779

=*Sympycnus thienemanni* (Stackelberg, 1931); Meuffels et Grootaert, 1987: 318

**Remarks:** The genus *Pycsymnus* was synonymized with *Chaetogonopteron* by Meuffels and Grootaert (1997b). However, *Pycsymnus thienemanni* was not transferred in the latter. The species was described with male hind tarsus with very short basitarsus bearing a curved seta and very short second segment bearing worm-like process (Stackelberg, 1931). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species also has a diagnostic setation on the fore and mid legs and remarkable wing maculation.

**Distribution:** Indonesia (Java).

***Chaetogonopteron vermiculatum* (Parent, 1932), comb. nov.**

=*Sympycnus vermiculatus* Parent, 1932a: 116

**Remarks:** The species was described and illustrated with male hind tarsus with short and enlarged basitarsus, and next segment short and bearing a worm-like apical process (Parent, 1932a). These characters clearly refer the species to the current concept of the genus *Chaetogonopteron* (Grichanov, 2011a; Bickel and Martin, 2016). The species has also a diagnostic setation on the fore leg.

**Distribution:** Indonesia (Sumbawa).

***Telmaturgus acutatus* (Yang et Grootaert, 1999), comb. nov.**

=*Chaetogonopteron acutatum* Yang and Grootaert, 1999: 267

**Material examined:** 1♂, India: West Bengal, Kalimpong (Lower Tanek), 27.06°N, 88.44°E, 625m a.s.l., 1-11.xii.2013, K. Tomkovich [ZMUM].

**Remarks:** The male studied has four dorsocentrals on mesonotum, strongly modified male fore tarsus and unmodified segments of male hind tarsus (see also Yang and Grootaert, 1999). These characters clearly refer the species to the current concept of the genus *Telmaturgus* (Grichanov, 2011b; Runyon, 2012).

**Distribution:** China (Yunnan). New species for India.

***Telmaturgus chebalingensis* (Wang, Yang et Grootaert, 2005), comb. nov.**

=*Chaetogonopteron chebalingense* Wang et al., 2005: 215

**Remarks:** The species was described with one hair-like and five strong dorsocentrals on mesonotum, modified male fore tarsus (segments 2-5 shortened, segments 4-5 bearing erect setae), unmodified male hind tarsus with non-shortened segments 1-2 and with regularly decreasing in length segments 2-5 (Wang et al., 2005). These characters clearly refer the species to the current concept of the genus *Telmaturgus* (Grichanov, 2011b; Runyon, 2012).

**Distribution:** China (Guangdong).

***Telmaturgus concavus* (Yang et Grootaert, 1999), comb. nov.**

=*Chaetogonopteron concavum* Yang and Grootaert, 1999: 271

**Remarks:** The species was described with one hair-like and five strong dorsocentrals on mesonotum, modified male fore tarsus (basitarsus as long as other segments combined), unmodified segments 2-5 of male hind tarsus and widely separated eyes on female face (Yang and Grootaert, 1999). These characters clearly refer the species to the current concept of the genus *Telmaturgus* (Grichanov, 2011b; Runyon, 2012).

**Distribution:** China (Yunnan).

***Telmaturgus dorsiniger* (Yang et Grootaert, 1999), comb. nov.**

=*Chaetogonopteron dorsinigrum* Yang and Grootaert, 1999: 271

**Remarks:** The species was described with four strong dorsocentrals on mesonotum, modified male fore tarsus (basitarsus 2 times as long as other segments combined), unmodified segments 2-5 of male hind tarsus (Yang and Grootaert, 1999). These characters clearly refer the species to the current concept of the genus *Telmaturgus* (Grichanov, 2011b; Runyon, 2012).

**Distribution:** China (Yunnan).

***Telmaturgus revanasiddaiahi* (Olejníček, 2002), comb. nov.**

=*Chaetogonopteron revanasiddaiahi* Olejníček, 2002: 54

**Remarks:** The species was described with four dorsocentrals on mesonotum, somewhat modified male fore tarsus (prolonged basitarsus and other segments shortened), hind basitarsus bearing ventral setae, and unmodified segments 2-5 of male hind tarsus (Olejníček, 2002). These characters clearly refer the species to the current concept of the genus *Telmaturgus* (Grichanov, 2011b; Runyon, 2012).

**Distribution:** India (Bangalore).

***Telmaturgus shettyi* (Olejníček, 2002), comb. nov.**

=*Chaetogonopteron shettyi* Olejníček, 2002: 54

**Remarks:** The species was described with one small and four strong dorsocentrals on mesonotum, modified male fore tarsus (basitarsus long, bent, thickened at apex, and other segments shortened), hind basitarsus bearing ventral setae, and unmodified segments 2-5 of male hind tarsus (Olejníček 2002). These characters clearly refer the species to the current concept of the genus *Telmaturgus* (Grichanov, 2011b; Runyon, 2012).

**Distribution:** India (Bangalore).

***Telmaturgus simplicipes* (Becker, 1908), comb. nov.**

=*Sympycnus simplicipes* Becker, 1908: 46; Grichanov, 2008: 45, fig. 28; Negrobov *et al.*, 2017: figs. 20-25 (designation of lectotype and paralectotypes)

=*Teuchophorus tenuemarginatus* Strobl, in Czerny and Strobl, 1909: 188; Grichanov and Tomkovich, 2009: 108

=*Telmaturgus tenuemarginatus* (Strobl, 1909), **comb. nov.**

=*Sympycnus turbidus* Becker, 1922: 105; Evenhuis and Bickel, 2012: 17, **syn. nov.**

=*Telmaturgus turbidus* (Becker, 1922), **comb. nov.**

=*Syntormoneura basalis* Curran, 1926: 16; Grichanov, 2008: 22

=*Telmaturgus basalis* (Curran, 1926), **comb. nov.**

=*Sympycnus placidus* Curran, 1926: 37; Grichanov, 2008: 22

=*Telmaturgus placidus* (Curran, 1926), **comb. nov.**

=*Sympycnus luteicinctus* Parent, 1926: 134, **syn. nov.**

=*Chaetogonopteron luteicinctum* (Parent, 1926); Yang and Saigusa, 2001: 509; Yang *et al.*, 2011: 1314, figs. 817, 842c-e

=*Telmaturgus luteicinctus* (Parent, 1926), **comb. nov.**

=*Chaetogonopteron apicinigrum* Yang and Grootaert, 1999: 268; Yang *et al.*, 2011: 1285, fig. 823, **syn. nov.**

=*Telmaturgus apiciniger* (Yang and Grootaert, 1999), **comb. nov.**

**Material:** 1♂, China: Guizhou [...], 28.v.2002, 1350m, *Chaetogonopteron luteicinctum* (Parent), det. Yang, 2002 (ZIN); 1♂, Myanmar: Shan state, env. Nyaungshwe, 20.66°N, 96.96°E, 26-30.xi.2009, N. Vikhrev (ZMMU); 2♂, 3♀, Indonesia: West Papua, Merauke env., 8.55°S, 140.43°E, 9-15.xii.2014, N. Vikhrev (ZMMU); 2♂, Indonesia: West Papua, Wamena Baliem Resort env., 2000 m, 4.06°S, 139.03°E, 16-25.xii.2014, N. Vikhrev (ZMMU); 3♂, 5♀, South Africa: Natal, Pietermaritzburg env., 20.vii.2008, Grichanov (ZIN).

**Distribution:** Type locality: Spain: Canary Is., Teneriffe. Palaearctic: Abkhazia, Austria, Azerbaijan, Czech Republic, Egypt, France, Germany, Greece incl. Crete, Iran, Iraq, Israel, Italy, Japan, N Kazakhstan, Korea, Kyrgyzstan, Russia (Adygea, Krasnodar), Spain incl. Canary Is., Tadjikistan, Turkey (Afyonkarahisar, Kütahya, Uşak), Uzbekistan; Afrotropical: DR Congo, Kenya, South Africa; Oriental: China (Fujian, Guizhou, Henan, Hong Kong, Guangdong, Guangxi, Macau, Shanghai, Taiwan, Yunnan, Zhejiang), India (Kashmir, West Bengal), Indonesia (Flores), Myanmar, Nepal, Philippines, Sri Lanka; Australasian: Australia, Hawaii, Papua New Guinea, Solomon Islands. New for Myanmar.



**Remarks:** Until recently this small species was overlooked in many countries of the Old World tropics and subtropics. Grichanov (2008) noted the identity of *S. simplicipes* material collected from Central Asia, the Mediterranean Region and Tropical Africa, and placed South African *Syntormoneura basalis* Curran, 1926 and *Sympycnus placidus* Curran, 1926 in synonymy with *S. simplicipes*. Grichanov & Tomkovich (2009) synonymized Spanish *Teuchophorus tenuemarginatus* Strobl, 1909 with this species. The species was also reported from Korea and Taiwan. Evenhuis & Bickel (2012) found no difference between *S. turbidus* material collected from Japan, Oriental China (Hong Kong, Taiwan), India, Flores, Macao, Nepal, Philippines, Sri Lanka, Australia, Hawaii, Papua New Guinea and Solomon Islands.

For this study I have compared the habitus and genitalia of hundreds *S. simplicipes* males from South Africa, Oriental China, Myanmar, Papua New Guinea, Japan and western parts of the Palaearctic Region and have found no difference. All male specimens examined have fore basitarsus bearing a row of elongate ventral setae on basal half and a row of elongate lateral setae at apex (MSSC). It is worth noting that published descriptions of *S. simplicipes*, *S. turbidus*, *S. luteicinctus* and *C. apicinigrum* did not note a weak ornamentation of fore tarsus in males. Females of the species have only a single small ventral seta at the base of the fore basitarsus, but having a broad face and strongly bulging clypeus (FSSC). A male from Guizhou Province of China identified by Ding Yang as *Chaetogonopteron luteicinctum* (ZIN), the description of this species by Parent (1926) and the detailed descriptions and figures of *Chaetogonopteron luteicinctum* and *C. apicinigrum* by Yang *et al.* (2011) are identical to the studied *S. simplicipes* material from the Afrotropical and Palaearctic Regions. Yang *et al.* (2011) distinguished *C. luteicinctum* from *C. apicinigrum* by the biseriata rather than uniseriate acrostichals on mesonotum mainly. Nevertheless, this character is individually variable in *S. simplicipes*, and the acrostichals are usually uniseriate anteriorly and biseriata posteriorly, sometimes irregularly uniseriate or biseriata along entire row length. The known descriptions of *S. turbidus* do not differ from the *S. simplicipes* species concept. As a result,

I consider it likely that *S. turbidus*, *S. luteicinctus* and *C. apicinigrum* are conspecific with *S. simplicipes*. Unfortunately, types of *S. turbidus* were not found in the European museums (e.g. Grichanov, 2008; Maslova *et al.*, 2008; Negrobov *et al.*, 2017), being probably lost. Designation of *S. turbidus* neotype is desirable to confirm that hypothesis. At the same time, the type localities of *C. apicinigrum* (Xishuangbanna, Yunnan) and *S. turbidus* (Kurseong, West Bengal) are rather close to each other. Summarizing data on the global distribution of *S. simplicipes*, *S. turbidus*, *S. luteicinctus* and *C. apicinigrum*, my study of their descriptions and morphology of available specimens from many countries, I propose here their synonymization.

The combination of modified male fore tarsomeres and strongly bulging female clypeus suggests the placement of *S. simplicipes* within the genus *Telmaturgus*, excluding it from *Sympycnus* (see Grichanov, 2011b; Runyon, 2012). The presence of 6 pairs of dorsocentrals on mesonotum in *S. simplicipes* is unusual for the most part of *Telmaturgus* species, though this character was described for males of some Afrotropical species (but with reduced first two pairs) and for females of Indonesian species (Hollis, 1964a; Grichanov, 2008).

***Telmaturgus singularis* (Yang *et* Grootaert, 1999), comb. nov.**

=*Chaetogonopteron singulare* Yang and Grootaert, 1999: 275

**Remarks:** The species was described with four strong dorsocentrals on mesonotum, modified male fore tarsus (basitarsus nearly as long as other segments combined, thickened at apex; next segment thickened), male hind tarsus with non-shortened segments 1-2 and with regularly decreasing in length segments 2-5 (Yang and Grootaert, 1999). These characters clearly refer the species to the current concept of the genus *Telmaturgus* (Grichanov, 2011b; Runyon, 2012).

**Distribution:** China (Yunnan).

**Discussion**

*Hercostomoides indonesianus* is a common Oriental species distributed widely from India to Philippines. *H. bhartii* sp. n. is found only on the New Guinea Island, being probably endemic of the island. The island is



traditionally included in the Australasian zoogeographical region, representing the northern edge of the Australian tectonic plate (Bickel and Dyte, 2016; Bickel and Martin, 2016). Thus, the *Hercostomoides* is discovered in the region for the first time.

*Hercostomoides indonesianus* and *Telmaturgus acutatus* are recorded here from India for the first time. As a result, the fauna of Indian long-legged flies has reached to 164 species (see Grichanov, 2016).

A total of 23 sympycnine species have been transferred to the genus *Chaetogonopteron*, and 8 species have been transferred to the *Telmaturgus* in this paper. As a result, the total number of *Chaetogonopteron* species reached to 103 (including 91 Oriental species), and the number of *Telmaturgus* species reached to 27 (including 11 Oriental species). In contrast, the genus *Sympycnus* has lost 23 species. Nevertheless, the *Sympycnus* with about 250 mainly New World species (Grichanov, 2017) is still a holding genus keeping many poorly described and illustrated small-sized dolichopodids. The Oriental *Sympycnus* fauna now contains 20 species, which mostly need a revision of type material. *Sympycnus* is also very diverse in Australia and New Zealand with many undescribed species (D. Bickel, 2017 pers. comm.). At the same time, the genus *Chaetogonopteron* needs revision on the regional scale. I suspect that many old Oriental species have been re-described as new ones during the recent decades.

The re-placements in this paper are based on MSSC and FSSC of generic importance that correspond to the *Chaetogonopteron* and *Telmaturgus* generic concepts. These genera are in fact marginal groups or satellites of *Sympycnus*, being distinguished by remarkable apomorphies. *Telmaturgus* can be defined by a combination of such synapomorphies as modified male fore tarsomeres and strongly bulging female clypeus in addition to bare antennal scape and regularly decreasing in length last four segments of hind tarsus. Adult males of *Chaetogonopteron* have the two basal segments of the hind tarsus greatly shortened, with tarsomere 2 often bearing an elongate process (clidium). Females cannot readily be separated from those of *Sympycnus* (Meuffels and Grootaert, 1997b). There are no known synapomorphies characterising *Sympycnus*. As

such, the genus is recognised by the absence of characters which define the other sympycnine genera (Grichanov and Brooks, 2017).

### Acknowledgments

The author is sincerely grateful to Drs. N. Vikhrev and A. Ozerov (Moscow, Russia) for their kindness in providing specimens for study. I am greatly indebted to Dr. D.J. Bickel (Australian Museum) for a useful discussion and comments on earlier drafts of the manuscript.

### References

- Becker, Th. 1908. Diptera der Kanarischen Inseln. Mitteilungen aus dem Museum für Naturkunde in Berlin 4: 1-180.
- Becker, Th. 1922. Dipterologische Studien. Dolichopodidae der Indo-Australischen Region. Capita Zoologica 1(4): 1-247.
- Bickel, D.J. and Dyte, C.E. 2016. Family Dolichopodidae. In: N.L. Evenhuis (ed.), Catalog of the Diptera of the Australasian and Oceanian Regions. (Online version). Available at <http://hbs.bishopmuseum.org/aocat/doli.html> (Last accessed: 16 March 2017).
- Bickel, D.J. and Martin, J. 2016. The family Dolichopodidae (Diptera) from high elevation Mount Wilhelm, Papua New Guinea. In: T. Robillard, F. Legendre, C. Villemant and M. Leponce (eds.), Insects of Mount Wilhelm, Papua New Guinea. Museum national d'Histoire naturelle, Paris: 83-116 (Memoires du Museum national d'Histoire naturelle, 209).
- Cumming, J.M. and Wood, D.M. 2009. Adult morphology and terminology [Chapter] 2. In: B.V. Brown, A. Borkent, J.M. Cumming, D.M. Wood, N.E. Woodley and M.A. Zumbado (eds.), Manual of Central American Diptera. Vol. 1. NRC Research Press, Ottawa: 9-50.
- Curran, C.H. 1926. Records of African Dolichopodidae with descriptions of new species. Revue zoologique africaine 14(1): 1-39.
- Czerny, L. and Strobl, G. 1909. Spanische Dipteren. III Beitrag. Verhandlungen der Kaiserlich-Königliche Zoologisch-botanischen Gesellschaft in Wien 5(59): 121-301.
- De Meijere, J.C.H. 1916. Studien über Südostasiatischen Dipteren. XII. Javanische Dolichopodiden und



- Ephydriden. Tijdschrift voor Entomologie 59: 58-194, 225-273, pl. 9.
- Dyte, C.E. 1975. Family Dolichopodidae. In: M.D. Delfinado and D.E. Hardy (eds.), A Catalog of the Diptera of the Oriental Region. Vol. II. Univ. Haw. Press, Honolulu: 212-258.
- Evenhuis, N.L., Bickel, D.J. 2012. Recent introductions of Dolichopodidae (Diptera) in the Hawaiian Islands. In: N.L. Evenhuis and L.G. Eldredge (eds.), Records of the Hawaii Biological Survey for 2011. Bishop Museum Occasional Papers 112: 17-18.
- Frey, R. 1925. Philippinische Dipteren II. Fam. Dolichopodidae. Notulae Entomologicae 5: 17-27.
- Frey, R., 1928. Beitrag zur Kenntnis der exotischen Dolichopodiden. Notulae Entomologicae 8: 17-23, fig. 1.
- Grichanov, I.Ya. 2008. Afrotropical *Sympycnus* Loew (Diptera: Dolichopodidae). International Journal of Dipterological Research 19(1): 17-65.
- Grichanov, I.Ya. 2011a. An illustrated synopsis and keys to Afrotropical genera of the epifamily Dolichopodidae (Diptera: Empidoidea). Priamus Serial Publication of the Centre for Entomological Studies Ankara Supplement 24: 1-99.
- Grichanov, I.Ya. 2011b. Species of the genus *Telmaturgus* Mik, 1874 (Diptera: Dolichopodidae). Caucasian Entomological Bulletin 7(2): 229-232.
- Grichanov, I.Ya. 2016. Two new species of *Campsicnemus* Haliday, 1851 from India with notes on some Oriental Dolichopodidae (Diptera). Halteres 7: 35-42. Available online at <http://www.antdiversityindia.com>. (Last accessed: 29 May 2017).
- Grichanov, I.Ya. 2017. Alphabetic list of generic and specific names of predatory flies of the epifamily Dolichopodidae (Diptera). 2nd Edition. St.Petersburg: VIZR, 1-563 pp. (Plant Protection News, Supplements, N23). Available online at <https://archive.org/details/Grichanov2014> DoliBank. (Last accessed: 29 May 2017).
- Grichanov, I.Ya. and Brooks, S.E. 2017. 56. Dolichopodidae (long-legged dance flies). In: Kirk-Spriggs, A.H. and Sinclair, B.J. (Eds.), Manual of Afrotropical Diptera. Vol. 2. Nematocerous Diptera and lower Brachycera. Suricata 5. Pretoria: SANBI Graphics & Editing, 1265–1320 pp.
- Grichanov, I.Ya. and Tomkovich, K.P. 2009. New data on the distribution of Dolichopodidae (Diptera) in Azerbaijan. International Journal of Dipterological Research 20(2): 99-110.
- Hollis, D. 1964a. Notes and descriptions of Indonesian Dolichopodidae (Insecta, Diptera) in the Zoologisch Museum, Amsterdam. Beaufortia 10: 239-274.
- Hollis D., 1964b. On the diptera of Nepal (Stratiomyidae, Therevidae, Dolichopodidae). Bulletin of the British Museum (Natural History) Entomology 15: 83-116.
- Maslova, O.O., Negrobov, O.P., Selivanova, O.V. 2008. New data on the systematics of some species of *Sympycnus* Loew, 1857 (Diptera, Dolichopodidae). Dipterists Digest 15: 44.
- Meuffels, H.J.G. and Grootaert, P. 1987. Dolichopodidae (Diptera) from Papua New Guinea 6: New species in the genus *Sympycnus* Loew, 1857. Indo-Malayan Zoology 4(2): 317-397.
- Meuffels, H.J.G. and Grootaert, P. 1997a. A remarkable new sympycnine genus *Hercostomoides* from South Asia, with remarks on the genus *Telmaturgus* (Diptera, Dolichopodidae). Studia Dipterologica 4(2): 473-478.
- Meuffels, H.J.G. and Grootaert, P. 1997b. Dolichopodidae (Diptera) from Papua New Guinea 16. *Scotiomyia* gen. nov., a new sympycnine genus from the rain forest with notes on the Papuan Sympycninae. Studia Dipterologica 4(1): 247-255.
- Negrobov, O.P., Grichanov, I.Ya. and Selivanova, O.V. 2017. Review of East Palaearctic species of *Sympycnus* Loew, 1857, with a key to species. Zootaxa 4277(4): 531-548.
- Olejníček, J. 2002. A note to the genus *Chaetogonopteron* (Insecta: Diptera: Dolichopodidae) of India with description of two new species. Journal of Experimental Zoology, India 5(1): 53-56.
- Parent, O. 1926. Dolichopodides nouveaux de l'extrême orient Paléarctique. Encyclopédie Entomologique (B II) Diptera 3: 111-149.
- Parent, O. 1932a. Dolichopodides de l'expédition du Dr. Rensch aux petites îles



- de la Sonde. Encyclopédie Entomologique (B II) Diptera 6: 103-123.
- Parent, O. 1932b. Sur quelques Diptères Dolichopodidés, la plupart appartenant à la collection L. Oldenberg. Notes et description (Dipt.). Stettiner entomologische Zeitung 93(2): 220-241.
- Parent, O. 1934. Etude sur les types de Dolichopodides exotiques de Francis Walker, conservés au British Museum. Annals and Magazine of Natural History (10)13: 1-38.
- Runyon, J.B. 2012. The Nearctic species of *Telmaturgus* (Diptera: Dolichopodidae). Canadian Entomologist 144(2): 337-347.
- Stackelberg, A.A. 1931. Dolichopodidae der Deutschen Limnologischen Sunda-Expedition. Archiv für Hydrobiologie, Suppl. Bd. Tropische Binnengewässer (Suppl.) 8: 771-782.
- Speight, M.C.D., Blackith, R.M. and Blackith, R.E. 1995. *Bathycranium*: synonymised with *Syntormon*, distinction between *Parasyntormon* and *Syntormon* discussed, and *S. bicolorellus* and *S. luteicornis* (Diptera: Dolichopodidae) redescribed. Insecta Mundi 9(3/4): 351-362.
- Walker, F. 1857. Characters of undescribed diptera in the collection of W.W. Saunders. Transactions of the Entomological Society of London 4: 119-158.
- Wang, M.Q., Yang, D. and Grootaert, P. 2005. New species of *Chaetogonopteron* (Diptera: Dolichopodidae) from Guangdong, China. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique. Entomologie 75: 215-219.
- Yang, D. and Grootaert, P. 1999. Dolichopodidae (Diptera: Empidoidea) from Xishuangbanna (China, Yunnan province): the Dolichopodinae and the genus *Chaetogonopteron* (1). Bulletin de l'Institut Royal des Sciences Naturelles de Belgique. Entomologie 69: 251-277.
- Yang, D. and Saigusa, T. 2001. New species of Sympycninae and Diaphorinae from Yunnan, Southwest China (Empidoidea: Dolichopodidae). Studia Dipterologica 8(2): 505-520.
- Yang, D., Zhang, L., Wang, M. and Zhu, Y. 2011. Dolichopodidae. In: Fauna Sinica, Insecta. Vol. 53. Beijing: Science Press, 1-1912 [In Chinese, with English summary].